



Zanzibar Protectorate

Annual Report
of the
Department of Agriculture
for the year 1959

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17 ft. Danish Motor Fishing Vessel on its way to the fishing grounds

Annual Report of the Department of Agriculture, 1959

SECTION A.—AGRICULTURE IN THE PROTECTORATE

1. General

The outlook at the beginning of 1959 was rather gloomy as far as the clove industry was concerned and, by that time, all sections of the public, including agriculturists, realised the dangers of depending on a two crop economy and, in particular, of depending so much on cloves. The existence of large clove stocks, and expectations that another bumper clove crop was about to be picked necessitated a fall in local market prices in the middle of the year, and a serious attempt was made to encourage growers to limit the picking by the Clove Growers Association promising to pay an initial low floor price plus a secondary payment which would vary inversely with the amount of cloves which the Association finally purchased. The publicity given to the objects of this scheme, which involved lectures and pamphlets, did much to convince the growers of the seriousness of the situation. The attempt to limit production, however, completely failed. In consequence the Clove Growers Association is not committed to make any second payment for the cloves purchased at the floor price. The picking of the whole crop increased the stocks held by the end of the year but this disadvantage has probably been very greatly outweighed by the fact that the money paid out by the Association to the growers for the large crop has been distributed much more widely and evenly to a greater number of pickers for a longer period of time, during a period when a great shortage of money prevailed. By the end of the year the overseas marketing prospects for cloves had shown signs of improving and the financial position of the Association had been considerably strengthened.

The role which the coconut industry played during 1959 was extremely important and indeed fortunate and opportune. The coconut crop was an average one, but owing to the overseas demand for fresh selected coconuts, the prices paid for coconuts of all qualities were enhanced for the greater part of the year. Furthermore, there was a very appreciable expansion in coir fibre production and more remunerative prices were received from abroad. The coconut industry consequently helped to alleviate a shortage of money in very many pockets.

The year 1959 was the last year of the 1955-59 development plan and a Working Committee was set up during the year to make proposals for another 5-year period. A great reduction in the funds expected to be made available to the department resulted in recommendations which included no new schemes and which concerned only some of the schemes already in being.

The need to diversify the Protectorate's crops has been given great publicity during the year and it was the subject of a series of special broadcasts which included the broadcasting of discussions with farmers. Economic and financial considerations have assisted in producing a good response to these recommendations and growers are at last showing interest in planting alternative crops in a practical way. As far as the Department's recommendations are concerned the emphasis is on cocoa, and the work carried out by the Department during the last two years on the establishment of cocoa has produced

remarkably successful results from which very valuable information has been gained. There seems to be no doubt now that provided cocoa is given treatments which are now known, it can be established very successfully and it is likely to produce satisfactory and economic yields.

2. Weather

The rainfall of 1958 was little more than two-thirds of the average, and at most recording stations there was a shortfall of some twenty inches of rain and about thirty wet days.

The year 1959 was also drier than average. A marked dry season from January to almost the end of March was followed by main rains which were of average intensity in Pemba and rather lighter than usual in Zanzibar. A short dry period from the middle of May was followed by considerable, unseasonal, rain in June and July. From August to November was a relatively dry period but in November the second rains arrived, showing for a short time an intensity greater than that experienced in the main rains.

The dry weather in March resulted in poor crops of maize and sorghum, but the period from April to August was ideal for the establishment of tree-crop seedlings. As is quite commonly the case, the weather during the second half of the year, with rather long dry spells and excessively heavy rain in November, was such as to make successful cropping rather difficult of attainment. Those who had undertaken their cultivations in good time and could plant under the most favourable conditions obtained good crops. Others experienced failure.

Rainfall is recorded at ten stations in Pemba and at twelve in Zanzibar, the majority of which are under the care of the Department of Agriculture. Temperatures and humidity are recorded at Wete in Pemba and Kisauni in Zanzibar. At most stations in Pemba the total rainfall for the year was 20 per cent. below average. In Zanzibar it was generally 12 per cent. below average. Detailed rainfall figures are given in Appendix V.

3. Principal Crops

CLOVES.

During the period from January to June the Clove Growers' Association continued to purchase cloves at the prices published on 1st August, 1958, namely, Shs. 115, Shs. 110, Shs. 105 and Shs. 95 per 100 lb. for good, fair, poor and inferior quality cloves respectively, delivered in Zanzibar, with prices five shillings lower for deliveries in Pemba. As is customary, most of the crop was sold as fair quality. The local market price of fair quality cloves in Zanzibar remained below Shs. 111 for the whole of the six months and the Association was in consequence required to purchase the greater part of the offerings. The clove crop for the seasonal year from July, 1958 to June, 1959 amounted to 7,046 tons (450,947 *frasila**) of which 5,870 tons (375,659 *frasila*) or 83 per cent. was the produce of Pemba. Of this crop the Association purchased 4,326 tons and at the end of the season had increased its stocks by 166 tons.

*In Zanzibar a *frasila* is 35 lb.

For the 1959/60 season the Clove Growers' Association offered floor prices on a two payment system. With a basic first payment of Shs. 70 per 100 lb. for fair quality cloves in Zanzibar and corresponding prices at the usual differentials for other grades and Pemba cloves, a second payment was dependent upon the total quantity of cloves purchased by the Association from 1st August, 1959 to 31st May, 1960. If the Association were to purchase more than 7,000 tons there would be no second payment; if a lesser quantity were to be purchased the second payment would be Shs. 10, Shs. 25 or Shs. 50 according to the quantity purchased. The purpose of this arrangement was to encourage growers not to pick all their cloves or to off-load them all onto the market and at the same time to provide producers with as much money as the Association could afford. As the figure of 7,000 tons was reached before the end of the year no second payment will be made.

The Association's new prices did not become effective until 1st August, and because they were announced at the end of June and were below the previous season's prices, practically all the old season cloves including some stockists' holdings were sold in the market before 1st August. Arrivals of new crop in August were entirely purchased by shippers and prices were between Shs. 101 and Shs. 105 at the beginning of the month. The rate of arrival increased considerably during September, prices dropped and the Association became the main buyer. Total arrivals at the Central Market and the Association's godowns from 1st July to 31st December amounted to 11,062 tons (708,000 *frasila*), which is equal to an average crop for a whole season. Three quarters of this amount were purchased by the Clove Growers Association. Pemba cloves were of good quality, clean and with negligible khoker though excess moisture was common. The Zanzibar cloves, by contrast, were less bright than usual and shippers experienced some difficulty in obtaining their normal requirements of Bombay and grocery quality cloves. Apart from colour the quality was high and they were consistently drier than Pemba cloves.

During August, Government took steps to explain fully to growers the financial and stock situation of the clove industry and the need for restriction of harvesting. At nine meetings in Zanzibar and nine in Pemba, some 1,800 people were addressed by the Representative Member concerned with Natural Resources and the Assistant Director of Agriculture, with the assistance in Zanzibar of a member of the Clove Growers Association Board of Management who is also a member of Legislative Council. The meetings were certainly instrumental in bringing the seriousness of the situation to the attention of growers and in clarifying matters of doubt and misunderstanding, but they were unsuccessful in persuading growers to limit picking or, indeed, sales to the Association. Crop owners made every attempt to harvest as much as possible and picking rates, which started at a fairly low price of 25 cents per *pishi* of green cloves later rose to 40 cents in some parts of Pemba.

Throughout the greater part of the year clove exports were at a low rate. India's buying quota was maintained at 10 per cent. of individual importers' highest purchases in any one year between 1951 and 1957 and this decreased her imports by 296 tons as compared with 1958. Owing to a series of difficulties culminating in currency devaluation, buying by Indonesia was uncertain, payment was delayed and orders were postponed but fortunately the situation improved towards the end of the year when a delegation from the Clove Growers Association and exporters visited Indonesia and obtained firm orders and normal payment arrangements were resumed. Business with other countries especially those which usually buy from Madagascar was above average and orders from the United States of America and Communist China were

encouraging. Of the total exports for the calendar year of 9,235 tons (compared with 9,102 tons in 1958 and 11,793 tons in 1957), 5,150 tons (55.8 per cent.) went to Indonesia, and 1,126 tons (10.6 per cent.) to India. The remainder went to some 40 other territories of which the most important were Continental Europe, Pakistan and the United States, which together purchased 14.4 per cent. of the total.

The proportion of their export consignments which exporters were required to purchase from the Clove Growers Association remained unchanged at 50 per cent. The Association's selling prices also remained at Shs. 255 per 100 lb. for Grade II, with Shs. 260 and Shs. 250 for Grades I and III respectively. Export duty on cloves was unchanged at Shs. 60 per 100 lb.

As the sole buyer of clove stems, the Clove Growers Association purchased 1,052 tons during the year, as compared with 4,411 tons in 1958. Exports of clove oil during 1959 amounted to 136 tons, a satisfactory achievement compared with 91½ tons in 1958 and 80 tons in 1957.

COCONUTS.

During the greater part of the year the local price of coconuts ranged from Shs. 130 to Shs. 170 per thousand, unhusked, on the heap, according to quality and accessibility for transport. During the last quarter prices rose to Shs. 215 per thousand. These prices are high in comparison with those ruling prior to 1959 and in relation to copra or oil prices. The cause was the continued demand for whole nuts from the European markets, particularly from the United Kingdom, Germany and Italy. When the demand first arose in 1958 a rush to export resulted in some poor quality shipments, but in 1959 exporters were more careful to meet the requirements of purchasers and trade continued steadily throughout the year. A total of 7,381,180 nuts were exported of which 4,724,130 were shipped to the United Kingdom and Europe, 2,105,900 to the Middle East and 551,150 to South Africa. Some nine million nuts had been exported in 1958 and two and a half million in 1957.

Copra prices in the local market remained generally steady throughout the year fluctuating around an average figure of Shs. 59/51 per 100 lb. F.M. quality, but there was a recession between June and August when prices dropped to Shs. 47/14, due to fears that the Phillippines were about to release reserve stocks of oil. This did not eventuate, however, and prices subsequently rose. The highest price, Shs. 64/29 per 100 lb. was reached in May and again in September and October. Exports of copra amounted to 7,911 tons compared with 10,103 tons in 1958. Of the total, 5,417 tons went to India, 2,170 tons to Europe and the remainder to Israel and Tanganyika. In 1958, 9,371 tons were shipped to India and only 300 tons to Europe.

The production of coconut oil continued to suffer from the competitive effects of high export prices for coconuts and copra. With no corresponding rise in the price of oil the millers were compelled to operate well below capacity and exports again showed a sharp decline. In all, 1,441 tons of oil were exported, compared with 3,333 tons in 1958 and 4,432 tons in 1957. This is the lowest figure since 1947. It includes 167 tons produced in Pemba. The East African mainland took 71 per cent. of the total.

Exports of coconut products for the year are shown in the accompanying table where they are also compared, as copra equivalent, with those of previous years.

			<i>Copra equivalent</i>			<i>Average</i>
<i>Exports</i>			<i>1959</i>	<i>1958</i>	<i>1957</i>	<i>1954-56</i>
			<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>
Copra			7,911	7,911	(b)10,103	5,934
Coconut oil ..			1,441	2,402	5,557	6,280
Coconuts ..			(a)7.38	1,054	1,291	232
Soap			1	1	2	3
TOTAL ..			11,368	16,953	9,873	12,449

(a) Millions of coconuts

(b) large carry over from 1957

The table shows that although copra exports in 1959 were less than in 1958 they were greater than the average of the two years 1957 and 1958 and greater than the average of the three previous years. The copra equivalent of all the coconuts and coconut products exported in 1959, however, was 1,000 tons less than the 1954-56 average, and 2,000 tons less than the 1957-58 average. This shortfall was partly due to a dullness in the oil market which caused unusually large stocks to be in the hands of millers at the end of the year. Total production of coconuts, copra and oil was probably only about 500 tons of copra equivalent less than average.

Exports of other coconut products were as follows:—

			<i>1959</i>	<i>1958</i>	<i>1957</i>
			<i>tons</i>	<i>tons</i>	<i>tons</i>
Copra cake			1,495	2,892	3,660
Coir fibre			3,196	2,425	1,523

The coir fibre industry continues to expand, and the expansion has been accompanied by a steady rise in prices. Increased production was obtained mainly by increasing production in the existing mills but also partly by the operation of one additional mill. The fibre is produced from dry unretted husks and is used for mattresses, upholstery, and similar purposes.

4. Subsidiary Export Crops

The local market price for chillies rose steadily from an average of Shs. 110 per 100 lb. at the end of 1958 to an average of Shs. 225 at the end of 1959. Unfortunately growers were unable to take advantage of these enhanced prices for they had reduced their plantings following a long period with the price at the low figure of Shs. 100. In consequence exports once again dropped and they amounted to only 33 tons as compared with 44½ tons in 1958 and 71 tons in 1957. Nineteen tons were shipped to the United Kingdom, nine to Australia and one ton was shipped to the United States.

There was a marked increase in exports of coil tobacco as compared with recent years. Shipments were made during each month from January to May and also in August, and exports amounted to 15,630 lb. compared with 1,440 lb. in 1958. Somalia was the sole buyer.

Difficulty was experienced in obtaining a market for derris root, the usual purchasers taking two consignments only, totalling 2,318 lb. compared with 6,278 lb. in 1958. One large manufacturer of insecticides in London expressed an interest in buying Zanzibar derris root but, when approached, failed to offer a price. In consequence it has been necessary to warn growers of the uncertainty of being able to dispose of this crop.

The lime crop showed an improvement on that of the previous year and the Clove Growers Association purchased $29\frac{1}{2}$ tons of limes compared with twelve tons in 1958. Exports amounted to 212 lb. of oil and 94 gallons of racked juice.

5. Food Crop Production

There being little demand for labour for picking the small 1958 clove crop, cultivators had plenty of time to devote to the production of rice. Although the acreage of the 1958/59 crop was higher than in the previous year, this was no very great achievement, for the 1957/58 acreage was the lowest for several years. A great deal more could certainly have been planted had the will been there, even though exceptionally dry weather in January and February restricted the preparation and sowing of plots in the drier areas. Comparative acreages for recent years are as follows:—

Year			Pemba	Zanzibar	Total
1959	..	..	10,958	6,573	17,531
1958	..	..	7,027	2,865	9,892
1957	..	..	9,675	7,878	17,553
1956	..	..	7,087	4,068	11,155

In considering the above figures it should be noted that the average rice acreage in Zanzibar island during the period 1944 to 1949 was 13,155, or double the 1959 acreage, while in 1948 an estimated 17,000 acres was planted. In Pemba the fall in recent years has been less marked but, nevertheless, considerable.

Growing conditions were very suitable in Pemba and a high average yield of 2,066 lb. per acre of dry paddy was obtained. In Zanzibar, on the other hand, dry weather adversely affected growth and a very low yield of only 972 lb. per acre was recorded. Total production of clean rice was estimated to be 6,862 tons, 5,150 tons in Pemba and 1,712 tons in Zanzibar. Imports of clean rice during the year amounted to 12,236 tons.

Maize and sorghum planted in late 1958 generally gave poor yields owing to dry weather, and the *masika* plantings of the same crops in 1959 failed in many areas owing to the lack of rain in March. In the south of Zanzibar island, however, the *masika* sorghum crop did very well. The cool weather and unusually abundant rain in June and July provided conditions very favourable for planting. Because of this very good crops of simsim were obtained in the coral areas and of cassava in the non-coral areas of both islands. There are indications that more cassava may be produced than can be consumed locally unless it is fed to stock, and the possibility of exporting any surplus is being considered.

Adequate supplies of foodstuffs were available in Pemba throughout the year and prices at local markets remained steady except for a temporary rise in the price of cassava at the beginning of the clove season. In Zanzibar, there was some shortage of staple foodstuffs in the coral areas of the south-east but abundant supplies existed elsewhere.

6. Animal Husbandry

The major development in cattle management during the year was the marked increase in the number of cattle which were sprayed for tick control in Pemba, the total reaching nearly double that for the previous year. This work is described more fully under Part II, Section 5, of this report.

The projected co-operative venture for the management of a stock ranch in Zanzibar made slow progress. A well was under construction but no cattle have yet been purchased.

The trend towards self-sufficiency in meat supplies in Pemba continued, and no animals were imported for slaughter during the year. At the same time increasing numbers of cattle were sent from Pemba to Zanzibar both for slaughter purposes and for breeding. This situation was brought about owing to the financial hardship suffered by the Pemba stockowners, and cattle were sold for relatively low prices, many breeding animals changing hands for as little as Shs. 250 per head. Whether this is having an adverse effect on the cattle population of Pemba is impossible to say in the absence of a stock census but it appears that natural increase aided by improved attention to health measures is maintaining the herds at their normal strength.

The number of cattle imported into Zanzibar for slaughter was the lowest for several years, supplies being made up from local stock. Imports of goats, however, were at the normal level. The following table shows the number of animals imported for slaughter in 1959 and previous years:—

			1959	1958	1957	1956	1955
Cattle	..	..	2,246	3,148	4,026	4,862	4,066
Goats	..	..	11,024	10,932	10,625	12,339	11,964
Sheep	..	..	1,035	1,198	1,208	1,319	1,442

Of the 1959 imports, 90 per cent. of the cattle, 56 per cent. of the goats and 78 per cent. of the sheep came from Tanganyika and most of the remainder from Somalia. The latter country supplied 205 cattle only compared with 871 in 1958.

The numbers of cattle and goats slaughtered for meat were about normal in Pemba, showing an increase on the 1958 figures, while in Zanzibar there was little change from the rather low figures of 1958. There was a one-third increase in the number of local calves slaughtered in Zanzibar. The number of sheep recorded as slaughtered in Pemba has decreased steadily from 371 in 1953, when there was a big clove crop. Details are given in the following table:—

Zanzibar Town Abattoir						
		<i>Oxen</i>	<i>Cows</i>	<i>Calves</i>	<i>Goats</i>	<i>Sheep</i>
Local stock	..	538	263	353	2,728	—
Imported stock	..	2,436	11	—	10,591	1,570
TOTAL	..	2,974	274	353	13,319	1,570
1958 Total	..	3,082	268	237	12,331	1,603
1957 Total	..	3,751	358	286	11,865	1,693

Pemba Townships and Rural Areas

		<i>Cattle</i>	<i>Goats</i>	<i>Sheep</i>
Local stock ..	..	3,236	1,118	—
Imported stock ..	..	—	22	1
TOTAL ..	..	3,236	1,140	1
1958 Total ..	..	2,988	1,020	18
1957 Total ..	..	4,507	1,097	58

The preparation of hides and skins at the Government drying shed in Zanzibar town was continued under the supervision of the Veterinary Officer. All these hides were suspension dried and treated with BHC powder. Bad flaying has not yet been overcome, and hides and skins not prepared under Government control often show signs of putrefaction. The Senior Hide Examiner of the East African Hide and Leather Bureau paid a welcome visit to the Protectorate, spending some time demonstrating the proper methods of hide and skins preparation, both in Zanzibar and Pemba. At his suggestion, rubber stamping of hides in place of branding and also the use of curved knives have been introduced.

The numbers of hides and skins dealt with in Zanzibar were as follows:—

		<i>Hides</i>	<i>Skins</i>
From abattoir ..	..	3,603	14,708
From rural areas ..	..	407	2,483
TOTAL ..	..	4,010	17,191
1958 TOTAL ..	..	3,960	16,238
1957 TOTAL ..	..	4,798	16,656

In Pemba the preparation of hides and skins was not under departmental supervision and no figures are available. The majority of the Pemba hides and skins were suspension dried but at Chake Chake the butchers' drying shed was closed by the local authority; an alternative site acceptable to both parties was not found before the end of the year and in consequence the hides had to be salt-dried. This is a retrograde step, for the market for salt-dried hides is very limited.

At Mtoni, on the outskirts of Zanzibar town, a number of dairymen keep herds of grade European breeds including Friesian, Ayrshire and Guernsey using Government sheds and paddocks provided for the purpose. At the end of the year there were eight tenants keeping 482 head of cattle consisting of nine bulls, 272 cows, 51 heifers, nine young bulls and 141 calves. In December, 221 lactating cows produced 236 gallons of milk.

The restriction on the import of cattle from Kenya, imposed in 1958 because of an outbreak of lumpy skin disease in that country, prevented the usual replenishment of the herds from that source. Some attempt was made to obtain female stock from Tanganyika instead, but in fact only six cows were imported.

Interest in commercial poultry keeping is awakening and there are now poultry keepers in Zanzibar who are keeping European-type poultry of varying degrees of purity on a fairly extensive scale. The eggs of one of these concerns, at least, are now competing in grocery shops with imported eggs.

SECTION B.—THE WORK OF THE DEPARTMENT

1. Staff

During the year one agricultural officer (expatriate) and one assistant agricultural officer (local) were appointed, and one assistant agricultural officer, the entomologist and a field officer (all expatriate) left the service.

At the end of the year, with the exception of the post of entomologist, the department was at its full strength. With the need for enhanced activity, especially in the realm of public relations and the development of new export crops, particularly cocoa, the present field and specialist staff are becoming increasingly stretched. The task of dealing expeditiously and economically with the technical and practical problems arising in their work is complicated by the problems arising from the gradual extension of the application of audit requirements to the lower, and sometimes illiterate, ranks of the Service.

The Director, Mr. A. K. Briant, O.B.E., was in charge of the department throughout the year except for seven weeks in November and December when Mr. Tremlett acted as Director. Zanzibar District was in the charge of Mr. J. V. Webdale until November, when Mr. Said Hamed took over while Mr. Webdale acted as Assistant Director. Mr. G. I. Walker was in charge of Pemba District, assisted by Mr. J. B. de Souza until November, when Mr. B. Buckler took over, and Mr. Walker became responsible for cocoa development work in that island. In Zanzibar Mr. Said Hamed Mauly undertook similar work as well as being in charge of the fruit scheme. Mr. B. G. C. Smith, Agricultural Officer, arrived on first appointment in August and for part of the year undertook the management of the Government Plantations. Mr. Othman Shariff remained responsible for artificial insemination, Mr. M. A. Ghassany for special extension work, and Mr. Bowden for Kizimbani farm. Dr. B. E. J. Wheeler, seconded from the Colonial Pool of Plant Pathologists in 1958 continued to work on withertip disease of limes. Officers in charge of other sections remained unchanged, as shown in the list of senior staff at the cover of this report.

Dr. Vanderplank, Entomologist, who had been in charge of the investigations into the control of *Pseudotheraptus wayi* since 1951 left on retirement in May, and his work was taken over by Mr. B. H. Hyde-Wyatt of the Colonial Pesticides Research Unit. The department is much indebted to this organisation for making Mr. Hyde-Wyatt and other staff available for these investigations. Mr. T. E. C. Robins, who had worked with the Clove Research team from 1951 to 1953 and subsequently was in charge of the sudden death experiments, left the department at the end of the year on completion of his contract. Mr. S. A. Mortished, Assistant Agricultural Officer, also left the department on completion of his tour, to make way for a local officer.

Mr. A. A. Jahadhmy, obtained his Diploma in Agriculture at Makerere College and joined the Department as Assistant Agricultural Officer in April. Mr. M. A. Shatry completed his studies in the United Kingdom obtaining a B.Sc. in Rural Science at Bangor University and resumed his duties as Assistant to the Government Chemist. A local student who completed his studies at Makerere College, obtaining a B.Sc. in Chemistry, Botany and Zoology was sent to Oxford University to take an honours degree in forestry. Applications were invited for a scholarship for a degree course in natural science, including zoology, with a view to eventual appointment as Fisheries Officer but no suitable candidate came forward.

2. The Development Programme

The second period of the Development Programme came to an end at the end of 1959. In preparation for the new period Government appointed a Working Committee to draw up proposals for the agriculture and natural resources section of the Development Plan for the years 1960 to 1964. The Working Committee, under the Chairmanship of the Representative Member concerned with Natural Resources, consisted of the Director of Agriculture, the General Manager of the Clove Growers Association and seven other persons the majority of whom were members of the Agricultural Advisory Committees, or of Legislative Council. The Committee received a number of suggestions for future development work, both from its own members and from the public. Since the total funds set aside for agricultural development during the five year period amounted to £350,000 only, of which £250,000 was reserved for a production council, the Committee found that the remaining £100,000 was only sufficient to provide for the continuation of some of the most essential current schemes. These included the three investigational schemes concerned with the control of sudden death disease of cloves, nutfall of coconuts and withertip disease of limes, two schemes concerned with livestock development in respect of milk and meat production, a fisheries development scheme, a scheme for the development of new cash crops, and another for the acquisition of land for the afforestation of the catchment area for the Zanzibar town water supply.

It was not possible to include the mechanical cultivation scheme or the citrus development scheme within the financial limit of £100,000 but proposals were made that they should be continued temporarily, and financed from the funds reserved for the production council. Forestry work was taken over as an integral part of the department's normal budget as was the scheme for village education in agricultural matters.

All these proposals were accepted by the legislature at the end of the year. The work in connection with the development programme constitutes a considerable part of the department's activities and much of the crop work dovetails with its normal investigations and extension work. With the exception of such schemes as that for mechanical cultivation, therefore, development activities are not separately described in this report.

3. Crop Husbandry

BANANAS.

The value of banana leaf and stem mulch for coffee, cocoa and young cloves has been evident in a number of trials, and it is clear that it would be of benefit to a wide variety of crops. At Kizimbani four acres of bananas have been planted specifically for the purpose of providing mulch. This is a practice which might well be followed by other cultivators of tree crops, particularly coffee and cocoa.

The response of bananas (Giant Cavendish or Mtwike) to dressings of farmyard manure was strikingly shown in the first year's yields of a manurial trial where the plots receiving farmyard manure at 100lb. per plant together with sulphate of ammonia at three lb. per plant produced a crop valued at Shs. 2,716 per acre compared with Shs. 358 from the untreated bananas.

CARDAMOMS.

A few plants received from Kew were planted for observation. Growth has been slow.

CASSAVA.

Experimental work with cassava included the testing of varieties received from Amani in 1956 at Kizimbani, Mkwajuni, and Makunduchi. Of the six varieties under test, variety 53121/22 shows the greatest promise followed by 5315/39. Also under test were selections from the 1953 batch at Kizimbani and the 1950 batch in Pemba. This work is amply justified by the increased yields obtained from the selected varieties. Considerable quantities of planting material of the earlier selections were issued free to cultivators in both islands.

Other cassava trials at Kizimbani have shown that applications of farmyard manure at the rates of ten tons and twenty tons per acre result in large increases in yield of up to ten tons of fresh roots per acre.

To determine the optimum level of application a manurial trial including farmyard manure at two, four, six, eight and ten tons per acre was laid down during the year.

CHILLIES.

Eight chillie nurseries were maintained in Zanzibar at which growers were provided with free seedlings. With the rise in the market price of chillies, greater interest was shown in the crop and some 464,000 seedlings were issued, compared with 184,649 in 1958. The peak figure in recent years was 617,522 issued in 1955. Pemba cultivators continued to show no interest in chillie production.

Highly profitable responses to manuring were obtained at Kizimbani where during the first three months of cropping an application of five tons per acre of farmyard manure trebled the yield and gave additional crop valued at Shs. 752 per acre based on a sale price of Shs. 240 per 100 lb. Superphosphate at 2 cwt. per acre gave a crop response valued at Shs. 320 per acre.

A small plot of the larger chillie, *Capsicum frutescens*, was established for trial.

CITRUS.

Although the payment of bonuses under the Citrus Fruit Industry Scheme of the Development Plan ceased in 1958, the department continued to give attention to citrus established by growers under the scheme. In particular, growers were encouraged to apply farmyard manure to their lime trees and 28 of them did so. Artificials were applied to a few trees in eighteen plantations as demonstrations and in most cases there was a visible response. Compost applied as a mulch to lime trees grown in *kinongo* soil at the department's Makunduchi farm produced a marked increase in crop as compared with trees not so treated.

Although there has been some improvement in the cultivation of private citrus plantations, fires caused the loss of $5\frac{1}{2}$ acres of limes and $1\frac{1}{2}$ acres of oranges. This compares with losses of 32 acres in 1958 and 20 acres in 1957.

About 10,000 budded lime plants, paid for by the Clove Growers Association, were issued free to 358 growers in Zanzibar. One-third went to growers who planted a few trees near their houses and about half were planted in the clove-growing areas. The largest allocation was 300 plants given to the Uroa Co-operative Society. Since 1957 a total of 15,020 lime plants produced by the department with funds provided by the Clove Growers Association have been distributed. Of the 150 acres planted, 67 acres were classed as good in 1959 and ten acres had been lost by fire.

Financial assistance provided by the Clove Growers Association ceased with the 1959 distribution. At the same time growers showed an increased interest in the crop and to meet the expected demand for plants in 1960 an attempt was made to produce large numbers of lime seedlings as well as budded plants. For various reasons this was not successful, and the numbers of plants available for issue in 1960 will be somewhat reduced. On the other hand about 100,000 rough lemon stocks were successfully established and these should enable adequate budded plants to be produced for distribution in 1961.

The Clove Growers Association continued to assist the industry by offering 20 cents a lb. for limes, a price which has been found to be uneconomic. Arrangements for buying were extended to Pemba. The Association produced lime oil, racked juice, syrup and cordial, supplying local and overseas markets.

Investigations into the control of withertip disease continued. There is hope that control by fungicidal sprays may be possible and economic except under the most adverse conditions, when rainfall is continuous and new growth is abundant. Present indications are that it will be advisable to spray during the September flowering but not during the flowerings of November and April when rainfall is heavier.

In 1956 a number of mature seedling lime trees in a plot at Kizimbani appeared to be strongly resistant to withertip disease. Budded plants from 20 of these trees (49 of each) were established in a single plot in 1957 and 1958 for observation of susceptibility to the disease. Commencing at the end of the plot nearest to a block of mature lime trees which were heavily infected, withertip has now spread throughout the plot, moving in the direction of the prevailing winds, and it appears that none of the progeny lines are resistant. Signs of resistance have also disappeared in the parent trees.

At Mkwajuni in the drier north of Zanzibar, 43 lime trees gave an average yield of 12 lb. of fruit compared with 18 lb. in 1958 and 45 lb. in 1957. The drop in yield is in part explained by severe shedding of young fruit during dry weather. At Makunduchi in the dry south of Zanzibar, although some shedding occurred, the application of a compost mulch resulted in a marked increase in crop, while a coir dust mulch also enabled the trees to carry more fruit to maturity. There is no doubt that the retention of moisture is most important under these conditions.

Rather more interest in citrus was shown in Pemba during 1959 and 874 lime plants (31 budded) were purchased as well as 1,329 budded orange and some 200 other citrus plants.

CLOVES.

For the 1959 distribution of clove seedlings fifteen nurseries were in use in Pemba and eight in Zanzibar. Half the seedlings, whose production was financed by the Clove Growers Association, were issued free and the remainder were sold at ten cents each. As in 1958 the numbers of seedlings produced were slightly in excess of the requirements in both islands. The number of seedlings distributed is shown in the following table:—

			<i>Free</i>	<i>Sold</i>	<i>Total</i>
Pemba	..	..	69,852	69,352	139,204
Zanzibar	..	..	136,170	136,170	272,340
TOTAL			206,022	205,522	411,544
1958 TOTAL	..	..	272,356	209,695	482,371
1957 TOTAL	..	..	296,303	184,657	480,960

Financial assistance provided by the Clove Growers Association which had been available since 1953 for the production of large numbers of seedlings, particularly in Pemba, ceased after the 1959 distribution. All seedlings to be distributed after May, 1959, have been produced from Protectorate funds. In view of the clove situation and the need to make more funds available for the production of cocoa and coffee seedlings, the number of clove seedlings being grown for distribution in 1960 was reduced to 50,000 in Pemba and 50,000 in Zanzibar. For the 1961 distribution the numbers are to be reduced to 20,000 in each island; the necessary nursery beds were prepared at seven centres in Zanzibar and five in Pemba.

Demonstrations of the control of dieback disease (*Cryptosporrella eugenioides*) by pruning have been carried out on some twenty privately owned plots in Pemba since 1953 and on sixteen to eighteen plots in Zanzibar. In view of the need for economy and bearing in mind the ease with which the demonstrations could be restarted if necessary, it was decided to discontinue them during the second half of the year.

Observations were continued on the four sites in Pemba at which attempts are being made to prevent the spread of sudden death disease amongst mature clove trees by trenching and liming. The deaths that have occurred do not so far give any indication of whether any of the treatments are effective.

The four plots in Zanzibar at which the prevention of "slow decline" of cloves is under test were maintained in good order. All the clove trees, the oldest of which are less than five years old, remained in good health.

In experiments at Kizimbani, farmyard manure applied in planting holes had an adverse effect on the establishment of clove seedlings in the field, and banana mulch was shown to be superior in this respect to coir dust mulch or no mulch.

COCOA.

During 1959 it was accepted that cocoa should be planted as rapidly as possible in both Pemba and Zanzibar. To this end the crop was publicised over the radio and in the department's bulletins and a 17-page booklet was printed. Arrangements were made to plant as much seed of the forastero variety as became available between October and January. It was considered that establishment and subsequent growth in the field would be most successful if the cocoa seedlings were raised each in its own receptacle from the time of sowing. Locally made baskets served the purpose well but were difficult to obtain in sufficient numbers and cost twenty cents each. "Whalehide" pots were cheaper and readily available and some 20,000 were obtained from the United Kingdom. Polythene sleeve was also obtained towards the end of the year and used to make bags ten inches deep. Since only a small number of baskets or pots were available when sowing began, most of the seed was planted in nursery beds and transplanted into the baskets or pots as they became available. In the event, the majority of the Pemba seedlings were raised entirely in beds while about half the Zanzibar seedlings were transplanted into pots. By the end of the year, 64,478 seeds had been planted in nurseries in Pemba and about 50,000 in Zanzibar. Germination was usually over 95 per cent.

To encourage landowners to plant cocoa and to demonstrate its culture, demonstration plots were established on private land in both islands. In Pemba three plots, each of one acre situated in the north, centre and south of the island were planted with cocoa in April and May at a spacing of twelve feet by twelve feet with bananas as a nurse crop at the same spacing. All made

very good growth. The cocoa seedlings received a dressing of sulphate of ammonia at the rate of one cwt. per acre before the *vuli* rains (October/November) and were also sprayed once (in one case twice) with D.D.T. In Zanzibar four plots comprising five acres were selected for cocoa demonstrations. Bananas were planted during the *vuli* rains and the cocoa will be planted in 1960.

Some ten years ago a demonstration plot of forastero and criollo cocoa was planted at Mwera in Zanzibar. This plot was under cassia shade and gave little crop. In 1959 the shade and the criollo trees were removed and the forastero trees were sprayed to control *Helopeltis*. The trees have rapidly acquired an abundant leaf cover and now appear very healthy. The gaps in the plot will be filled with forastero seedlings in 1960.

At Kizimbani, cocoa experimental work continued. In a manurial trial and a spacing trial planted in 1955, the permanent shade (*Peltophorum*) was reduced considerably without ill effect. The nurse crop of bananas was also removed by degrees. In the manurial trial the first year's cropping suggests that there may be a strong response to superphosphate. The spacing trial was abandoned as such since even the closest spacing is now considered to be too wide. Two manurial trials were planted during April to investigate the effect of manurial treatments on establishment and cropping. The trials are identical and the four treatments consist of farmyard manure at 50 lb. per tree per annum, sulphate of ammonia at three lb., single superphosphate at three lb. and sulphate of potash at three lb. Permanent shade of *Peltophorum ferrugineum* and *Grevillea robusta* and temporary shade of bananas and cassava were established in 1958 and the cocoa was planted at 12 feet by 12 feet, with twelve trees per plot. The cassava shade was uprooted by October and the bananas were thinned from time to time, the thinnings being used for mulch. The cocoa seedlings were attacked by the weevil *Systates* and by *Chrysomelid* beetles whenever a new flush of leaves occurred and it was found necessary to spray the plants with D.D.T. in August, September and December. Dieldrin was applied in October to control the ants which tend mealy bugs on the cocoa, as an indirect means of controlling the mealy bugs themselves.

Progeny rows of the seedlings from 25 parent trees of forastero which were planted in about 1898, and of 11 Upper Amazon and one amelonado variety the seed of which was obtained from the West African Cocoa Research Institute in Ghana, were planted for observation. During this first year the growth of the Upper Amazon and amelonado varieties was markedly greater than that of the local forastero.

In November, 426 cocoa seedlings were planted at 10 feet by 10 feet under coconuts spaced at thirty feet by thirty feet, with bananas for shade and mulch interplanted at ten feet by twelve feet. The cocoa plants made good progress. Preparations were made for planting cocoa between cloves and land was prepared for a spacing trial covering seven acres. Both these trials will be planted in 1960.

The department continued to harvest, ferment and prepare the cocoa of private growers in Zanzibar, free of charge. There are about twenty private cocoa growers owning 15,636 trees. The 1958-59 crop which was mostly criollo, amounted to 2,139 lb. of which 1,120 lb. was the produce of Government plantations and 1,019 lb. of private persons including the Public Trustee. It was sold through the Clove Growers Association on the London market at a price of Shs. 252 per cwt.

COCONUTS.

The Copra Board continued to provide the department with funds for the production of coconut seedlings. The seedlings were sold at the subsidised rate of ten cents each and the following numbers were issued:—

			1959	1958	1957
Zanzibar	..	..	70,959	71,015	51,817
Pemba	..	..	39,253	34,956	34,893
TOTAL	..	..	<u>110,212</u>	<u>105,971</u>	<u>86,710</u>

The Board also continued to pay the salaries of two copra inspectors whose duties consisted of advising on the production of good quality copra and the construction of kilns of the Ceylon type. To further this work, two masons are provided in Zanzibar and kiln materials (iron bars and expanded metal) are sold at cost price in both Zanzibar and Pemba. These facilities have been provided for a number of years.

In a survey of copra kilns in Zanzibar island 591 kilns were recorded. Of these, 537 were of the Ceylon type and were owned by 400 copra makers, and 54 were of the old type in which the copra is supported on sticks laid horizontally over the fire. Of the Ceylon type kilns, 476 were constructed with the fire chamber below ground level and 61 with the fire at ground level and the copra bed raised on stone walls. The Copra Board had supplied the materials for 414 of the Ceylon type kilns. There were 68 regular copra makers who relied on sun-drying only.

In experimental work with coconuts the spraying trial in which about 100 acres were sprayed with D.D.T. against *Pseudotheraptus wayi* showed a reduced yield during the second year of protected crop. It is not clear whether this is a physiological reaction to increased cropping during the first year or whether the spray is having a cumulative adverse effect on the palms. At Kizimbani a manurial trial was planted in which the five treatments consist of 100 lb. farmyard manure applied at planting, annual applications of 5 lb. single superphosphate, 5 lb. sulphate of ammonia and 5 lb. muriate of potash per palm, and a coconut husk mulch.

Dwarf "King" coconuts from Malaya began to bear four years after planting the seed in the nursery.

The Entomologist of the Colonial Pesticides Research Unit who was posted to Zanzibar in May succeeded in establishing a colony of *P. wayi* and in raising numbers of the Chalcid egg parasite *Ooencyrtus* sp. He also obtained specimens of a Strepsipteron parasite *Halictophagus* sp. but was unable to breed it in the laboratory.

COFFEE.

As in previous years, nurseries of *liberica* coffee were maintained at Kizimbani and at nine clove nurseries in Pemba and five in Zanzibar. Once again, approximately two-thirds of the expenditure on the seedlings issued in April, 1959 had been met by the Clove Growers Association and growers were therefore given two free seedlings for each one purchased at thirty cents. Fewer seedlings were produced than in the previous year and the demand was not satisfied. Issues were as follows:—

			1959	1958	1957
Zanzibar	..	..	11,126	14,404	10,090
Pemba	..	..	4,398	10,415	5,231
TOTAL	..	..	<u>15,524</u>	<u>24,819</u>	<u>15,321</u>

Large numbers of seeds were sown during 1959 for issue in 1960 and it is expected that 40,000 seedlings will be available in Pemba and 30,000 in Zanzibar.

Experiments on coffee at Kizimbani include a manurial trial and a pruning trial on *liberica* coffee, and a variety trial planted in 1957 to compare *liberica*, *excelsa* and *robusta* species. The *excelsa* has shown the greatest vigour but all three are growing strongly and the *robusta* is producing the largest crop in this first year of bearing. During 1959 two further trials with *liberica* coffee were laid down; one repeats on a large scale the small manurial trial which has proved the value of mulch but given inconclusive results in respect of artificials; the other trial tests the value of a banana mulch, various combinations and rates of application of farmyard manure and artificials, and both mechanical and hand cultivation, with the aim of ascertaining the field treatment which will give the greatest economic return.

The sample of *liberica* coffee sent to London at the end of 1958 was well reported upon. The present intention, however, is to satisfy the local market before attempting to export.

DERRIS.

Nurseries for the supply of planting material of derris were maintained in Zanzibar but were abandoned in Pemba as the demand had ceased. Rooted cuttings were supplied free to all interested growers and some 29,600 cuttings—sufficient for planting two to four acres—were issued, compared with 1,800 in 1958.

In a spacing trial at Kizimbani in which the rows were three feet apart and the plants three feet, two feet, one foot and six inches apart in the rows, the closest spacing gave the greatest yield, namely 1,537 lb. of dried root per acre after 18 months in the field. If the harvesting task is based on the number of plants lifted, as is the case at Kizimbani, the greatest profit is obtained from the one foot spacing. If, however, the task is based on row length or if the crop is harvested by the owner, the six inch spacing would give the greatest nett return.

Mealy bugs seriously attacked a plot of derris in the north of Zanzibar, completely covering the roots and killing the plants. The attack was halted by the application of aldrin.

KAPOK.

Four acres of mainland kapok at Kizimbani yielded rather better than in previous years giving 456 lb. per acre of lint with seed compared with an average of 120 lb. in the previous five years. A few trees of dwarf kapok from St. Vincent, which were planted in 1955 at the edge of a moist valley, have made very much better growth but have not yet produced a crop.

MAIZE.

In a manurial and spacing trial with white maize planted in the first rains of 1958 an application of ten tons farmyard manure with two cwt. single superphosphate and one cwt. sulphate of ammonia per acre had given a yield increase of 2,052 lb. per acre. This crop was followed by a crop of yellow maize without further additions of manure or fertilizer and again a highly significant response was obtained, the manured plots averaging 1,126 lb. and the unmanured plots 274 lb. per acre of dried grain. Other trials on maize at Kizimbani included spacing and manurial trials arising from results obtained in 1958 and previous years. Yields were generally low owing to unfavourable

weather but a number of significant responses were obtained. In general they confirmed the value of applying both farmyard manure and artificials and showed that significant responses could be obtained even in a year of low yields. The previous year's finding that sulphate of ammonia may be applied at the time of sowing instead of as a top dressing without loss of response was not borne out by the 1959 trial, where top dressing gave significantly greater yields, both at the one cwt. and two cwt. per acre levels.

NUTMEGS.

A demonstration plot of two acres of nutmegs was planted on private land in Zanzibar and five other plots, each of one acre, were prepared for planting in 1960; two of these were in Pemba. At Kizimbani a manurial trial was planted. Four mature trees at Kizimbani yielded an average of 32.7 lb. of nutmegs, the crop being spread over six months from October to March.

PATCHOULI.

A few plants of patchouli were established from plants obtained from the Comoro Islands.

PINEAPPLES.

Prospective growers were assisted in obtaining planting material by the department purchasing suckers at four cents each from growers and selling them to applicants at the same price. Some 15,362 suckers were issued in this way.

At Kizimbani the value of coir dust mulch, first demonstrated in a trial planted in 1954, has been re-affirmed in a trial planted in 1958 in which coir fibre dust was applied to a depth of three inches at planting but was not renewed or added to. After three years an appreciable amount of mulch remains; sufficient to retain moisture but not to smother weeds. During the first two years of cropping the mulch has almost doubled the crop, giving 1,583 lb. per acre of fruits compared to 860 lb. The increased crop resulting from the application of mulch may be valued at Shs. 290 per acre. The two trials at Kizimbani and similar results obtained elsewhere demonstrate that mulch should invariably be used in pineapple growing. Coir fibre dust should be used with discretion, however, if other crops are to follow the pineapples, for when the mulch remaining from the 1954 trial was ploughed in, in the absence of added nitrogen fertilizers, it caused a reduction in yield of the sorghum crop which followed.

RICE.

During the 1958/59 rice season the use of fertilizers was demonstrated on fifteen privately-owned plots of which six were in Zanzibar and nine in Pemba. The fertilizers used were two cwt. single superphosphate and one cwt. sulphate of ammonia per acre. In no case did the fertilizers fail to give an increase in crop. In Zanzibar the fertilized plots gave an average of 1,624 lb. dry paddy per acre while the unfertilized plots gave 1,159 lb. The corresponding figures in Pemba were 3,226 lb. and 1,732 lb. While the exactness of the Pemba figures is open to question owing to the small size of sample taken in each case, the validity of the comparison is not in doubt and the differences are very striking.

These and other results were publicised prior to the 1959/60 rice season and a field campaign for the use of fertilizers was undertaken towards the end of 1959. Results have been not unsatisfactory, particularly in Zanzibar, and total sales for the 1959/60 rice season were expected to reach four to five

tons of superphosphate and one to two tons of sulphate of ammonia. This would amount to more than three times as much as was sold in any previous year.

Demonstration plots in Zanzibar during the 1958/59 season also included the three Trinidad varieties D/52, Red American and Sughandi. D/52 gave the highest yield at all six sites which were representative of the drier or moderately wet rice areas. All varieties were acceptable to growers and during the 1959/60 rice season some 1,310 lb. of D/52, 523 lb. of Red American and 380 lb. of Sughandi seed were sold to growers in Zanzibar.

Rice experiments undertaken during the year included fertilizer trials in Pemba and at Kizimbani, and at the latter centre trials of Trinidad and Sierra Leone varieties and local selections and also a planting distance trial. An experiment that has been continued in being since 1955 compares the effects of different treatments of the fallow break between successive rice crops. The treatments are clean cultivation, sweet potatoes with and without farmyard manure, pulses planted on ridges (groundnuts) and on the flat (green gram or cowpea) and an untouched natural grass fallow. The trial has since its inception been duplicated in a wet and a dry area and both have given fairly consistent results, though they differ one from the other. In the wet area ridging for catch crops increased not only the total production from the land but also the annual rice crop, and this increased production is further increased by the use of farmyard manure on the catch crop. Sweet potatoes and groundnuts are the most suitable catch crops. In the drier areas catch cropping raises the total production but only increases the rice crop when green gram is planted on the flat. The greatest total production of food crops occurs where a catch crop of sweet potatoes with farmyard manure is taken but this treatment gives the lowest rice yield. The reason for this adverse effect is not known but it may be connected with lodging or the increase in susceptibility to drought which follows the early stimulation of growth. This may perhaps be overcome by the use of the variety D.52/37.

SWEET POTATOES.

The varieties B.44 and Caroline Lea continued to be grown for the distribution of planting material to the public. The former variety was also used for manurial trials. Once again farmyard manure proved its value, both in a direct trial with artificials and also in a residual trial where sweet potatoes were planted as the third crop in a rotation following two maize crops (described also in the section dealing with maize). In this trial manure was applied for the first maize crop only, but the manured plots gave 3.36 tons of fresh roots per acre compared with 1.45 tons from the unmanured plots. A plot of nearly two acres in a fertile stock paddock failed to produce any roots but yielded $34\frac{1}{2}$ tons per acre of green fodder.

TOBACCO.

In the early part of the year it became clear that a market for Virginia tobacco was unlikely to eventuate owing to increased production on the mainland. Attention was therefore turned to Turkish tobacco and a small quantity of Solouk seed was obtained from Rhodesia. This was sown in June, about six weeks later than the normal time, at Kizimbani and near Muongoni in the coral area of the south of Zanzibar island. At Kizimbani the crop developed Granville Wilt and had to be destroyed. At Muongoni it grew well and 108 lb. of prepared leaf was produced from a quarter acre. The rock surface of the plot made it difficult to plant the tobacco seedlings

closer than about one foot by one foot and in consequence much of the leaf was rather large. This defect was probably aggravated by the fact that the plot was being cultivated for the first time after many years' rest under bush and the level of fertility was undoubtedly high. Self-fertilized seed was successfully obtained for continuation of the investigation in 1960.

4. Mechanical Cultivation

The mechanical cultivation unit, financed under the Rice Scheme of the Development Plan, continued to have as its main purpose the provision of mechanical cultivation in peasant rice growing. It also continued to make its services available for other work, whether directly agricultural or not, when not required for rice cultivation. The amount of rice work obtained during 1959 compared unfavourably with that undertaken in previous years, but this was balanced to some extent by an increase in other work. Even so, the total acreage cultivated amounted to no more than 1,288 acres, as compared with 1,698 acres in 1958, and 1,432 acres in 1957. Financially also, the scheme did not do well, the total subsidy during the year rising to £5,005 as compared with £3,793 in 1958 and £4,795 in 1957. Revenue during the year amounted to £3,141. While essentially due to the lack of work obtained, the loss was aggravated by the need for incurring extra expenditure on complete overhauls of the older tractors.

Following the policy of gradual replacement of the original light tractors by heavier models, an additional tractor with disc-plough was purchased during the year, bringing the total to fourteen machines of which eleven were made available in Zanzibar and three in Pemba. Eight of these are light petrol-driven wheeled tractors which were obtained at the inception of the scheme and the remaining six are heavier diesel-powered wheeled tractors of more recent date. Also purchased during the year was a seed box attachment for use with disc-tillers.

In spite of the fact that a higher proportion of the year's work than usual was undertaken in coconut plantations—operations which are generally expensive owing to the rough conditions encountered—tractor output improved due to the greater use of the heavier diesel machines. Thus the average number of engine hours per acre cultivated, which had fallen from 5.20 in 1955 to 3.79 in 1958 was reduced further to 3.46 in 1959. Similarly, fuel consumption fell from 1.06 gallons per hour in 1958 to 0.86 gallons per hour in 1959, and consumption per acre fell from 4.02 gallons to 2.98 gallons.

These improvements, however, were insufficient to offset the disproportionate overhead costs resulting from the poor demand for tractor work. Thus the average cost of all cultivations for the year including all overheads, amounted to Shs. 36/68 per hour or Shs. 126/50 per acre compared with Shs. 22/25 per hour or Shs. 84/45 per acre in 1958. At the scale of charges in use, these costs resulted in losses to the scheme of Shs. 22/54 per hour or Shs. 77/72 per acre, for all types of cultivation taken together. The costs of the different types of cultivation over the 12 months, ranged from Shs. 15/82 per acre for drilling to Shs. 151/95 per acre for ploughing. It will be appreciated that while these are true costs, including all overheads, they give a false comparison between the two cultivations, insofar as the small amount of drilling that was undertaken all took place at a time of maximum activity when overheads were widely spread, whereas at times of minimum activity ploughing was the only operation undertaken and was thus required to bear all the overheads during that period. During the period from 1st January to 31st March, when the tractors were reasonably fully engaged, ploughing cost Shs. 88/72 per acre, disc-tilling Shs. 69/27, ridging Shs. 60/64, weedcutting with the

Marden weedcutter Shs. 35/19 and drilling Shs. 15/82 per acre. Charges to the public were made on a sliding scale varying with acreage, and averaged Shs. 42/22 per acre for ploughing, Shs. 30/65 for disc-tilling, Shs. 48/54 for ridging, Shs. 48/42 for weedcutting and Shs. 24/27 for drilling.

From these figures it will be seen that it would be necessary to increase the charges for ploughing by Shs.46/50 per acre, or more than 100 per cent., if the operation is to pay at the present level of acreage. Such an increase would be beyond the capacity of the cultivators to bear, though it is true to say that present charges for tractor cultivation are rather lower than the cost of hired hand labour. Past experience, however, has shown that with sufficient employment tractor ploughing can cover its costs. This was demonstrated during one period of a month in an earlier season when ploughing costs were no more than Shs. 48 per acre. But until such time as the organisation is given ample work for its tractors it will be necessary to subsidise the majority of its operations.

The 1958/59 clove harvest was small and prices were low. In consequence, rice growers—who are also traditional clove pickers—found themselves with plenty of time to prepare their rice fields by hand and with little cash to spare for mechanical cultivation. Thus, during the 1958/59 rice season, no more than 441 acres were ploughed in Zanzibar as compared with 1,173 acres in the 1957/58 season. Total cultivations for the season amounted to 646 acres, of which 27 acres were drilled. The ploughed acreage amounted to 6.6 per cent. of the estimated rice acreage in Zanzibar island. In other years it has varied from 12 to 39 per cent.

The reduction in the acreage of rice which was mechanically cultivated was due principally to fewer people making use of the tractors, although there was a reduction in the average size of the plots ploughed. This is made clear in the following table.

	1955/56	1956/57	1957/58	1958/59
Number of people	588	1,188	932	415
Number of plots ploughed ..	688	1,455	966	432
Average size of plot (acres) ..	0.69	0.68	1.21	1.02
Average acres per person ..	0.81	0.83	1.25	1.07

High operating costs are very largely due to the small size of the plots cultivated, and the average size of the plot has not increased to the extent hoped for. To counter this, a scale of charges has been employed since the beginning of the 1958/59 season, in which the price per acre is progressively reduced as the size of plot is increased. The reductions are quite substantial and make it well worthwhile neighbours bringing their plots together for the ploughing operation. But while there was some co-operation in this matter during the first season when the new charges were introduced, the effort was not sustained, and during the 1959/60 season few growers made the necessary arrangements with their neighbours.

Rice growers were again slow to make use of the tractors during the 1959/60 season and ploughing did not start until October. Unfortunately, it was very quickly brought to a halt by excessive rain and for six weeks no work could be done. This illustrates the difficulties of tractor operation under Zanzibar conditions and draws attention to the need for growers to be ready to make use of the tractors whenever conditions are favourable. In all, some 231 acres were cultivated by the end of the year. The 1959/60 season's acreage is expected to reach 800.

Between the two rice seasons work was obtained in plantation areas and also in the preparation of land for football pitches and similar purposes. The total area of such cultivations reached 918 acres as compared with 486 in 1956, the best previous year. This improvement, however, does not indicate a widespread trend towards use of the tractors, for much of the increased cultivation was undertaken for three plantation owners who are not representative of the majority.

The above discussion and figures deal only with the operation of the scheme in Zanzibar island. At the same time there was in operation in Pemba one tractor during the 1958/59 rice season and three tractors during the 1959/60 rice season. In Pemba, there is very little scope for plantation cultivation and the only work of this nature which was undertaken was for the Department. During the 1958/59 rice season 108 acres were ploughed and five acres dis-harrowed. By the end of the year, 55 acres had been ploughed for the 1959/60 season and a total of 150 acres of ploughing was expected for the full season. Revenue for the year amounted to £283 while running expenses, excluding overheads, repairs and overhauls, amounted to £266.

5. Stock Husbandry

STOCK IMPROVEMENT.

There has been no change in the policy followed for the Kizimbani herd of Zebu dairy cattle where Boran bulls have been used on the local Zebu for the improvement of milk yields. The culling standard has remained at 2,600 lb. milk in either of the first two lactations. With about 105 cows and heifers in the milking herd, five young bulls were under test and the proven sire No. 399 was used as much as possible. Boran bull No. 1000, which completed its initial services in 1958, died of tuberculosis and one of the five young bulls under test died of babesiosis.

The milk herd was grazed in fenced paddocks and in open coconut plantations when grazing was short. The entry of outside cattle to the station presents a health problem which increases as the numbers increase. Though it is possible to ensure that cattle belonging to squatters on the Government plantation surrounding Kizimbani are dipped regularly, the same degree of control cannot be applied to cattle brought in from outside.

Milking cows were fed a ration of 4 lb. coconut cake with chopped cassava, as long as their milk yield was over 90 lb. of milk per week. Cows giving less than 90 lbs. received cassava only. Calves were bucket fed on whole milk, butter milk powder and skimmed milk. A few calves were reared on nurse cows. Unwanted bull calves were sold at birth. Of the 124 calves born during the year, 21 were got by artificial insemination. Two-thirds of these were by bull 399, and he alone was used in 1959.

A better control of east coast fever was obtained than in previous years, only three deaths out of a total of thirty being due to this disease. These all occurred during an outbreak after the late rains in November. There was, however, an increase in the other principal tick-borne disease, babesiosis, which caused five deaths. None of the milking herd died during the year but calf mortality rose to 21.9 per cent., the highest figure on record.

Ninety-five lactations were completed during the year, as compared with 76 in 1958 and 99 in 1957. The average milk yield in 305 days of these lactations fell slightly to 1,932 lb. and the average monthly milk index in pounds per cow in milk per day fell to 7.3 lb. The highest figures previously attained

were 2,349 lb. for the average lactation, achieved in 1955, and 9.0 lb. milk index in 1955 and 1956. The continuing fall since then is attributed to the coming into milk of the progeny of several bulls which are clearly inferior to No. 399, who was largely responsible for the previous peak performances.

Six Kizimbani bred bulls continued at stud in Pemba and between them performed 142 services on privately owned cows. No charge is made for this service. In last year's report reference was made to the successful rearing of two bull calves of good parentage which were sent from Kizimbani to Pemba at birth in 1958 to be reared on nurse cows in the presence of an east coast fever challenge. Both contracted e.c.f. and recovered during that year but both died under a second attack in 1959. Two other calves sent to Pemba in 1959 succumbed in the same manner.

It is generally considered that a calf which has received colostrum from its mother at birth and which contracts east coast fever when it is less than six months old will almost certainly recover from the attack. Experience in Zanzibar however indicates that even under those conditions calves born at Kizimbani have practically no resistance to the disease and usually die. It is thought likely that calves cannot acquire resistance to the disease from a mother which itself has never had the disease.

These losses confirm the necessity of relying on artificial insemination for spreading improved Kizimbani blood in Pemba. A service was started in July with semen flown to Pemba packed with ice in thermos flasks. Before the end of the year 23 cows and heifers had been inseminated. These belonged to 21 private persons living as far apart as Konde in the north and Chambani in the south. Since 19 of the animals were found to be in calf after a single insemination it seems likely that the service will be readily accepted.

In Zanzibar the A.I. service has not expanded as rapidly as was hoped and only 31 privately owned animals were inseminated during the year, as compared with 57 in 1958 when the scheme started. It is recognised, however, that a rapid change in custom cannot be expected. Much will depend on having at Kizimbani bulls which not only are proven for milk yield but which also look well.

The success of the insemination technique cannot be determined very accurately firstly because the old bull 399 was mainly used and his sperm was of very poor quality and secondly because it is impossible to retain control over the privately owned cows; cases were known where a cow, after receiving A.I., was taken to a bull at the behest of the owner's friends or relatives. However it may be noted that in Pemba the conception rate at the first insemination was 83 per cent., in Zanzibar district it was 71 per cent. and at the Department's Tunguu ranch, where the method was used for five months and eleven cows were inseminated, the rate was 82 per cent. At Kizimbani, however, in 44 animals the rate was only 27 per cent. Since, however, of the animals which failed to take at the first A.I., 26 out of 27 returned again after subsequently being served naturally it would seem that some other factor is the cause of the low conception rate in these animals rather than the insemination technique. Of 68 Kizimbani animals which were served naturally during the first nine to ten months of 1959 (excluding four animals receiving treatment for infertility) 25 returned after the first service, giving an apparent conception rate of 63 per cent. at a single service. The average calving interval in the whole herd during 1959 was 422 days, or 14 months, which is not unreasonable.

FODDER AND PASTURE IMPROVEMENT.

At Kizimbani the use of a Marden weed cutter greatly improved the quality of rough pastures under coconut palms. At this station kudzu continues to supply the bulk of the cut fodder and maize silage is also used. Over 64 tons of green fodder were obtained from the vines of 1.9 acres of sweet potatoes which failed to produce roots. A small quantity of Israel sweet clover was sown during the year and made fair growth.

Silage was re-introduced at Makunduchi demonstration farm in the dry south of Zanzibar, both maize and wild grasses being used successfully. At this centre some seven species of grasses were planted for observation.

The imported grasses which were under test at Tunguu ranch have failed to establish themselves naturally and when strip planted in paddocks have failed to stand up to grazing. In a protected plot *Brachiaria brizantha* has shown itself to be hardier than all others tested, including *Cenchrus ciliaris*, *Setaria sphacelata*, and *Digitaria smutsii*; *Eragrostis curvula* showed fair vigour.

Night paddocking of stock in electric fences or in permanent paddocks on the ranches is having a marked effect on the vegetation. *Heteropogon contortus* is being replaced by more palatable species, particularly *Digitaria* and the positions of the moveable night paddocks is clearly indicated by the greenness of the vegetation.

STOCK RAISING (CATTLE RANCHES).

The Department continued to operate cattle ranches at Hanyegwa Mchana, Tunguu and Pangeni. The two former carry breeding stock while the herd at Pangeni is confined to growing and fattening bullocks. At the end of the year there were 727 head at Hanyegwa, 771 at Tunguu and 138 at Pangeni, making a total of 1,636 as compared with 1,389 at the end of 1958. In addition there were five goats at Tunguu. A total of 91 animals were sold during the year of which 36 were fat bullocks, 40 were culled cows and 15 were stunted or incapacitated young bullocks or heifers. Some difficulty was experienced in disposing of fat bullocks at a reasonable price until one butcher ran out of stocks of imported animals shortly before Christmas.

This has been another good year for births, with 164 calves born at Hanyegwa Mchana and 216 at Tunguu, a total of 380, compared with 145, 161 and 306 respectively in 1958. At Hanyegwa the calving percentage dropped from 87.4 per cent. in 1958 to 75.2 per cent. in 1959 but at Tunguu it rose from 73.5 per cent. to 83.1 per cent., in spite of the fact that there were only two bulls at Tunguu from December, 1958 to February, 1959. Birth weights also improved during the year, the average being 38.6 lb. compared with 37.5 lb. in 1958 and 35.4 lb. in 1957. The 1959 and 1958 calves were all from Boran bulls whereas the 1957 calves were by local bulls.

Mortality was not high, in spite of unfortunate outbreaks of east coast fever at Pangeni where six animals died and at Tunguu where eleven animals, including a new Boran bull from Tanganyika, died or had to be destroyed. Total adult mortality was only 0.9 per cent. at Hanyegwa, 5.2 per cent. at Tunguu and 5.4 per cent. at Pangeni, involving a total of 47 animals. Of these, 37 animals died from tick-borne disease. None succumbed to trypanosomiasis, but four died from antrycide poisoning. These are the first cases of death from this cause. Calf mortality fell at both centres, to 4.3 per cent. at Hanyegwa and 2.8 per cent. at Tunguu. If deaths due to accidents such as falling into holes in the coral rock are excluded, the percentage calf mortality at Hanyegwa would have been 1.7 per cent. only.

Although there were no deaths from trypanosomiasis, the disease is still serious at Tunguu where, in spite of prophylactic treatment, over thirteen per cent. of the animals were infected in November and December, and over nine per cent. in June. During six months of the year there were no cases at Tunguu, while Hanyegwa remained free throughout the year. Since prophylactic treatment was not fully effective at Tunguu, bush clearing operations were extended further afield. The first case of trypanosomiasis at Pangeni occurred in November. No tsetse flies had been obtained there in the fly rounds undertaken with a bait ox. Work on the disease is described more fully in a subsequent section.

To replace the six Boran bulls from Kenya which died in 1958, five young Boran bulls were obtained from Tanganyika in July. They were stationed at Tunguu and the remaining Kenya bulls were concentrated at Hanyegwa Mchana. Three young bulls of Boran x local blood from Kizimbani were also brought in. As the ranches approached full stocking capacity it was possible to cull a number of the older or poorer cows and heifers and altogether 46 female stock were disposed of.

Small brand numbers were introduced during the year and brands were placed just above the hock joint instead of on the thigh. Coopertox spray fluid was introduced as an alternative to Gammatox for every alternate four-week period. The Tanganyika bulls were also regularly hand dressed with a proprietary cattle grease but in spite of these precautions one bull succumbed to e.c.f. at the end of the year. Routine dosing for worms was given to all young stock.

Fifteen bullocks at Hanyegwa and fifteen at Pangeni were treated with hexoestrol in June. The animals were four and five years of age. Rather surprisingly significant positive responses were obtained at both centres. The average increase in weight three months after implantation of the treated animals was 19.0 lb. at Hanyegwa and 54.1 lb. at Tunguu. The corresponding figures for sixteen untreated animals at each centre were 0.4 lb. and 36.0 lb. respectively.

The construction of labour lines and a veterinary assistant's house was begun at Pangeni. The well there has caused difficulty. A little water was found at 42 feet but this was lost on further digging and nothing was obtained until at 71 feet water entered from the bottom rising to a depth of 20 feet. When the windpump was erected and the water was pumped out the well remained dry. At the end of the year deepening of the well was once again going forward.

VETERINARY ACTIVITIES (DISEASE CONTROL).

There was no change in the strength of the Veterinary Section of the Department, and it continued to provide veterinary attention at five centres in Pemba and three in Zanzibar, including the section's headquarters at Maruhubi in Zanzibar. In addition, a travelling clinic continued to operate in Zanzibar, making regular visits to country areas, particularly those where trypanosomiasis occurs.

The number of clinical cases treated at the eight centres and by the travelling clinic throughout the year were as follows:—

		Cattle	Goats and Sheep	Donkeys	Dogs and Cats	Poultry	Others
Zanzibar	..	2,903	299	316	831	5,717	40
Pemba	..	897	65	32	114	1,587	9
TOTAL	..	<u>3,800</u>	<u>364</u>	<u>348</u>	<u>945</u>	<u>7,304</u>	<u>49</u>

In Zanzibar, the number of cattle treated dropped by about 500 compared with 1958 while the cattle cases in Pemba increased by about 200. These changes reproduced almost exactly similar changes which occurred between 1957 and 1958. In Pemba, wounds were once again the commonest cattle complaint, numbering 369 cases. Ophthalmia cases were also numerous, 224 animals being treated. Sixty-eight animals were treated for helminthiasis and 46 for anaplasmosis and babesiosis. Amongst Zanzibar cattle, 995 cases of trypanosomiasis were treated, and there were 729 cases of wounds, 365 of helminthiasis, 284 of tick-borne diseases and 234 of ophthalmia. Some 40 other ailments were also treated. Tuberculosis was diagnosed in three cows at the Mtoni dairies and a Kenya Boran bull at Kizimbani died of the disease. There were no outbreaks of notifiable diseases during the year. The numbers of poultry treated increased by over 3,700 in Zanzibar and by 800 in Pemba. In the latter island, worms, coccidiosis and fowl pox were the only ailments of any consequence. In Zanzibar, in addition to these three diseases, pediculosis, aegyptianellosis, and coryza cases were also numerous.

Precautionary treatments included 3,481 trypanosomiasis prophylactic treatments with antrycide prosalt and 150 with prothidium, 2,234 vaccine inoculations against Newcastle disease of poultry, 9 for African horse sickness, four for distemper, two for rabies and one for feline enteritis.

Dipping against tick-borne diseases continued to be employed by the commercial dairymen operating near Zanzibar town and also for the Department's cattle at Kizimbani and Hanyegwa Mchana. In Pemba, some 35 privately-owned animals were dipped weekly at one of the three dips in that island, as compared with 50 in 1958. The number of cattle brought to be sprayed on the other hand, increased markedly in Pemba, although no new areas were covered. Both the dipping and the spraying services are provided entirely free and it seems that expansion of the latter will be limited only by the extent to which Government is prepared to finance a free service or the extent to which cattle owners are prepared to pay for it. The average numbers of animals sprayed per week are shown in the following table:

			1959	1958	1957	1956	1955
Zanzibar	..	..	922	909	619	568	248
Pemba	..	..	843	469	295	165	—
TOTAL	..	..	<u>1,765</u>	<u>1,378</u>	<u>914</u>	<u>733</u>	<u>248</u>

Gammexane was in general use for the district spraying, but toxaphene was introduced and was used in alternation with it at the Tunguu ranch, where it was found that incomplete protection was given and a number of animals, including imported Boran bulls, succumbed to east coast fever. This occurred when it became necessary to graze the herds outside the ranch for a period. Elsewhere in those parts of the country where spraying has been in progress for some few years now, east coast fever is still present but it is of mild virulence with very low mortality. It is of interest that although babesiosis is not a very important disease amongst native cattle kept in the rural environment it is invariably severe when it occurs in the grade animals of the commercial dairy herds and in the dipped or sprayed Zebu herds belonging to the Department. So far there are no positive signs of resistance in cattle ticks to the acaricides used, and the village cattle owners are satisfied that the animals remain reasonably free from tick infestation. But it is known that gammexane which has now been in continuous use for some years in dog dips and in dog baths in private homes has been losing its effect on the common dog ticks *Rhipicephalus sanguineus* and *Haemophysalis leachi*.

Prophylactic treatment for trypanosomiasis is confined to Government cattle on the two ranches of Hanyegwa Mchana and Tunguu. At the former, four-monthly treatment with antrycide prosalt has totally suppressed the disease. At Tunguu the response to prophylactic measures has been less satisfactory. Following inoculations with prothidium in July and December of 1958 the herd remained free of trypanosomiasis for periods of two to three months but cases occurred thereafter. In July, 1959 the larger part of the herd was given antrycide prosalt and the remainder prothidium. There were no positive cases in August and September, but over thirteen per cent. of the animals were infected in October and November. There was no difference in the infection rate as between those animals which received antrycide and those which received prothidium. The outbreak occurred during a period when owing to shortage of grass on the ranch it was necessary to graze the animals near to the tsetse infested bush. During this period also, cloudy weather no doubt enabled tsetse flies to range further afield. It seems likely that the most effective use of prophylactic drugs will be obtained by administering them at such times as these.

During the past few years, blood of wild animals has been examined for trypanosomiasis whenever opportunity offered. This has been done partly to determine the species which may be involved in carrying trypanosomiasis and partly to determine whether *T. simiae* is present in Zanzibar. If it is not present, and if it is capable of causing mortality in the wild bush pig in Zanzibar its introduction might perhaps be considered as a possible means of destroying pigs which certainly provide food for tsetse and possibly are the main non-domestic animal carriers of the trypanosomes causing trypanosomiasis in cattle. During 1959 a total of 70 animals, birds and reptiles were examined. *T. congolense* was found for the first and only time in the blood of a wild pig. No other trypanosomes were found, but babesia were found in a pig, a monkey and a dik-dik. There are reasons for believing that the negative observations carried out with pig's blood are not necessarily reliable.

The presence of epizootic lymphangitis, which had been diagnosed clinically on a number of occasions, was confirmed by the Veterinary Laboratory, Kabete, Kenya from specimens taken from a donkey. A number of deaths from hard pad occurred among dogs at Ndijani and Chwaka in Zanzibar. No steps could be taken to control the disease owing to the cost of the vaccine being prohibitive in relation to the animals concerned.

Some heavy losses from Newcastle disease occurred among poultry throughout Zanzibar but Pemba apparently remained free. Very few birds that had been inoculated in 1958 contracted the disease and in these mortality was very low. Further inoculations were given at request on payment. The importance of prophylaxis against coccidiosis and helminthiasis is now appreciated by a number of poultry keepers, and a few practise regular treatment. The number of dead poultry brought to the veterinary office for *post mortem* examination has increased steadily in recent years. This is an indication of an increased awareness of the value of poultry and veterinary advice.

6. Forestry

Forest legislation enacted during 1959 consisted of the declaration of Forest Reserves in respect of Ngezi Forest in Pemba, the Dunga plantation and the Unguja Ukuu mangroves. The reports of the Reserve Settlement Officers in respect of the other mangrove areas in Zanzibar and Pemba were received before the end of the year. In general these reports indicated that

there were no individual rights in respect of any of the mangrove areas but that local custom recognised local usage of the forest material. Consideration was given to the policy to be adopted for the future use of the mangrove areas, in the light of the Reserve Settlement Officers' reports.

It is considered that the mangrove forests are a national asset and as such must be maintained and if possible improved. There is a danger that with the expansion of economic activity they may be improvidently used and their permanent value seriously impaired unless control is exercised consistently and effectively. At the same time the legitimate interests of the individual local communities must be upheld and the active co-operation of these communities in the protection of the forests stimulated.

A considerable amount of illicit felling undoubtedly occurred in many areas, particularly in Zanzibar island but convictions in the Zanzibar courts totalled seven only compared with seventeen in 1958. In Pemba, there was less illegal cutting than in 1958, and few prosecutions were necessary. In both islands exploitation of the mangrove forests within the regulations decreased considerably in comparison with 1958, no doubt reflecting reduced purchasing power of the general public. In Zanzibar the number of poles (excluding fitos) extracted from Chwaka Bay was little more than half that of 1958, while in Pemba also extraction was less than two-thirds the 1958 amount. In the following table are shown the numbers of poles of different types for which cutting permits were given during the year.

Type	Zanzibar		Pemba	
	Chwaka	Other	Special	Ordinary
Nguzo	1,111	135 ..	287	2,147
Boriti	171	144 ..	149	2,039
Makombamoyo ..	930	210 ..	104	670
Miamba	25	2 ..	218	2,938
Mapau	2,148	339 ..	158	3,554
Fitos	13,007	1,560 ..	740	20,903
Number of permits issued	—	— ..	66	640

Note:— All figures for the numbers of poles are in scores. For Zanzibar island, details are given by area, "Other" referring to Unguja Ukuu and Muongoni.

For Pemba, the division is by species, "Special" referring to *Rhizophora* sp. and *Bruguiera* sp. and "Ordinary" referring to all other species.

Turning to upland forests, progress was made in the exploitation and re-forestation of Ngezi Forest in Pemba. The concessionaire felled and extracted all the *ngulele* (*Antiaris toxicaria*) from four compartments of the first coupe and two of these were prepared for planting, with felled branchwood being stacked in windrows. It is disappointing, however, that no market can be found for the *njoho* (*Odyendia zimmermanni*) which is the most abundant species in much of the forest. Earlier plantings of *mvule* (*Chlorophora excelsa*) in eight other compartments of the forest, where the natural canopy is relatively thin, were maintained by slashing the competing undergrowth, and further new planting was undertaken in two additional compartments. Here 1,570 *Chlorophora* plants and 565 *Calophyllum inophyllum* seedlings were planted. In addition, *Calophyllum* seed was intersown between the planted trees. This arrangement, with *Chlorophora* planted at 36 ft. x 36 ft. and *Calophyllum* seed interplanted along the rows at 6 ft. espacement, will probably be adopted as standard practice. The *Calophyllum* can be exploited as poles if necessary and it provides an insurance in the event of the failure of the *Chlorophora*.

The future of Jozani forest remained under consideration. Meanwhile re-afforestation continued within the area of 484 acres purchased by Government in 1948. This forest is noteworthy for its content of *Calophyllum inophyllum*, which seeds and germinates freely. Regeneration with this species, following exploitation in the past, is done by removing the weed species which compete with self-sown seedlings and by planting seedlings in areas where there are insufficient mother trees to produce natural regeneration. Altogether 17,180 *Calophyllum* seedlings were planted in 1959. Some 2,000 *Eucalyptus* were planted along compartment boundaries.

Relations with the villagers bordering Jozani forest were not altogether happy. Three fires occurred in a small recently planted area of drier ground, the circumstances suggesting arson. As a measure of co-operation 40 large *Calophyllum* stems within the 484 acres were made available to local applicants and these were utilised fully for masts, spars and boat-ribs. Subsequently, other villagers were given permission by the Reserve Settlement Officer to cut a number of *Calophyllum* trees in that part of the forest outside the 484 acres purchased by Government. In this case some forty well-grown trees containing much valuable timber, were felled for the sole purpose of obtaining a few naturally-shaped boat-ribs from the upper branches. This distressing waste of forty or more years' growth is an example of what can happen in the absence of proper control.

Afforestation of the Masingini Ridge catchment area continued. Some 12,286 *Casuarina*, 918 *Grevillea robusta* and 50 *Pinus patula* nursery seedlings were planted, as also some 10,450 seedlings of *Calophyllum* in the cotyledon stage. The condition of the latter and of the *Casuarina* is excellent, but the *Grevillea* and the pines have been less successful.

Two further parcels of land on the Masingini Ridge amounting to 80 acres were acquired during the year, and prepared for planting in 1960. In addition two areas of 201 acres and 66 acres were surveyed and plans prepared but the acquisition could not be finalised before the end of the year.

Gulley stopping on the western slope of the ridge has been very effective in some cases. Earth dams reinforced with poles and branchwood, made some three or four years ago, have held back the flow of water and caused deposition of soil which is now covered with a dense growth of grass and shrubs. *Acacia auriculiformis* planted in these gulleys have established themselves and will further bind the soil. Further dams were made in 1959. The Walezo plantation, at the southern end of the Masingini Ridge, was maintained in good condition by prison labour.

At Kichwele, where forest planting with *Eucalyptus* and *Casuarina* is also undertaken with prison labour, good progress was made. In all, 18,762 seedlings were planted covering an area of about 49 acres. The majority of these were *Eucalyptus*. *Ailanthus glandulosa* was planted experimentally.

In view of the difficulties that have been experienced in establishing fuel plantations in the coral areas of Dunga and Ubago it has been decided not to extend the plantings already made. These, however, are being maintained and gaps in them are being filled as necessary. At Dunga, 8,131 *Eucalyptus* seedlings were planted to fill gaps in five compartments and one compartment was planted or seeded with *Terminalia catappa*.

Three boxes containing pines—*Pinus eliottii*, *P. patula* and *P. radiata*—were imported from Kwale, Kenya, together with soil containing mycorrhiza. They were planted out in the field amongst the existing stock of pines, which had hitherto made poor growth, in order to inoculate them. All now have a healthy appearance and are making satisfactory growth, indicating efficient spread of the mycorrhiza.

Amongst experimental work, a planting trial at Kichwele demonstrated the value of rearing seedlings in pots or tins rather than in beds, particularly as regards *Casuarina*. Variation in depth of planting, however, contrary to expectations had little effect.

A trial coppicing of *Acacia auriculiformis* showed conclusively that this species cannot regenerate in this manner. Its main use must be as a coloniser and a ground-cover possibly to provide conditions under which more valuable species could be planted.

7. Fisheries

Significant advances in the fishing industry took place in two directions during 1959. In the first place a considerable number of fishermen obtained nylon nets on loan and operated them successfully; secondly, the opening of two cold stores has contributed towards overcoming the difficulties of marketing large quantities of fish resulting from fortuitous or seasonal large catches. At the same time, two enterprising and energetic charterers of powered fishing boats have demonstrated that with industry and application the method can be highly successful.

The fisheries loans scheme under which three 22 foot Danish powered boats were on charter continued to operate during the year. In one case, where the boat was operating from Pemba, the charter-purchase payments were not being paid regularly and the boat was returned to Government. The other two vessels, operating from Zanzibar port, made regular visits to fishing grounds which are outside the normal reach of the traditional outrigger canoes. Leaving harbour at night they invariably brought back good catches in time for the morning market. Most of this fish was obtained with nylon nets but some was caught with a wire fish trap introduced by the Fisheries Officer. Based on the traditional heart-shaped *dema* trap made from the midribs of coconut or wild oil-palm leaves or split withies of *mpava*, the wire trap is too heavy to use in outrigger canoes but is ideal for use in the Danish boats which have a powered capstan. These traps can be set at greater depths than the *madema* and can be left for longer periods as there is no risk of them being damaged by marauding sharks.

During the year two Seagull outboard engines of 5 h.p. were acquired by local fishermen through the loans scheme. These cost Shs. 1,500 and a down payment of Shs. 500 is required from applicants. The loans are repaid over a period of ten months. Outboard motors are somewhat beyond the resources of most fishermen, but nylon nets are not. To obtain a net and plastic floats costing Shs. 1,350 a deposit of Shs. 350 is required. During the year loans amounting to nearly £1,500 were given for the purchase of nylon nets. Since October, 1958, when nets became available under the loans scheme, 15 fishermen in Zanzibar and 14 in Pemba have received loans and acquired nylon nets. Four fishermen completed payments on their first net and obtained a further loan for a second one, demonstrating their satisfaction with the scheme.

The export of frozen crawfish tails and crabs, which was begun in 1958, continued throughout 1959 and catching was extended to Pemba. The company concerned in this venture erected at the end of the year a cold store capable of lowering temperatures to minus 20 degrees Fahrenheit, which compares favourably with temperatures maintained in the cold stores of Europe and America. This store is expected to be most useful, not only in

relation to the crawfish export trade but also in storing fish caught by local fishermen surplus to immediate local requirements. A second and smaller cold store was opened earlier in the year and although the temperature achieved is only slightly below freezing point, and inadequate for storing for export, storage for two or three days is possible.

8. Extension Work

Steady progress was made in the scheme for group education in agricultural matters in a limited number of villages. Of the original six villages in Zanzibar which came under the scheme four have made good progress. During the year a seventh village group was included and contacts were established with cultivators in four other areas with a view to opening classes there in 1960. This expansion has been made possible through the posting of a second officer to this work and because some of the groups are now well established and require less frequent visits.

The method of working in these villages continues to be through daily morning visits to the fields and evening gatherings with discussions and the showing of lantern slides, for a period of about ten days in each village. In general, the groups are showing an awakening interest in improved methods of agriculture and a number of members have successfully taken part in group discussions on the radio. Improvements during the year include the acceptance of cattle spraying at Bweleo (though they are not yet prepared to consider grazing improvement), the use of fertilizers and dung at Ndiyani and Jendele and the expansion of chillie planting at Uroa, including a change to the bird's eye variety. The limes planted in this village during 1958 were well looked after as was the coffee planted at Uzini. There was a considerable extension of food crop cultivation generally at Uroa and Bweleo.

The groups were provided with Arabic-script Swahili reading material on a number of subjects and were from time to time entertained and instructed with coloured transparencies projected on a small screen, dealing with such topics as the use of farmyard manure, fertilizers, compost and mulch and the prevention of erosion. These transparencies were all taken locally.

An attempt was made to interest the groups in Young Farmers' Clubs and one such club was formed at Uroa.

Continued use was made of the radio. Regular fifteen minutes' broadcasts were given every week, consisting of talks, discussions and a play series. In addition a special series of discussions on crop diversification were given to stimulate interest in cocoa, limes, coffee, chillies and other cash crops.

No agricultural show was held in 1959, but two of the usual farmers' days were organised at Kizimbani. In addition two groups of women—from the Uzini and Ndiyani areas—were for the first time taken to Kizimbani. They showed great interest in the cropping methods demonstrated and some of them at once began to use cattle manure on their return home. For the first time farmers' days were also held at the small demonstration farms of Makunduchi and Mkwajuni in Zanzibar. Both were very successful attracting altogether some 100 farmers.

Schools in both Pemba and Zanzibar were visited by field staff from time to time to advise on the school gardens. Senior staff gave occasional talks to secondary school pupils and one member of the Department gave a series of 14 lectures to rural health workers in training; these lectures were concerned with soil fertility, soil erosion and nutrition in relation to agriculture. The trainees were also taken to see aspects of the Department's work in the field.

9. Distribution of Planting Material

The production and distribution of planting material of a wide range of cash crops and food crops continued as in former years. Clove, coffee and coconut seedlings were produced at nurseries scattered throughout Pemba and Zanzibar and chillie seedlings were produced at a number of nurseries in the latter island. Seedling and budded citrus were produced at Kizimbani and at four centres in Pemba; Kizimbani was also the source of supply of various other fruit trees and miscellaneous plants. Planting material of cassava and sweet potatoes was issued from three centres in Zanzibar and one in Pemba.

One half of the clove seedlings were issued free, their production having been financed by the Clove Growers Association, and the remainder were sold at ten cents each. For the same reason all cocoa seedlings and two-thirds of the coffee seedlings were issued free; the remaining coffee seedlings were sold at thirty cents each. The production of coconut seedlings was financed by the Copra Board and the seedlings were sold at ten cents each. Seedlings other than cloves, coconuts, cocoa and chillies were sold at thirty cents each and top-worked plants at Shs. 2. Chillie seedlings were issued free as was planting material of derris, cassava and sweet potatoes. Edible seed was sold at market rates.

A list of the planting material distributed in 1959 is given in Appendix II.

10. Government Plantations

The accounts for the year, which are given in Appendix I, show a nett loss of £1,287. Gross expenditure amounted to £22,824. This includes the salaries and expenses of all senior staff, labour and all general expenditure in relation to the maintenance of the plantations and the disposal of the produce, and also non-revenue-earning expenditure such as the collection and fermentation of cocoa for the general public and the production of compost for sale at a subsidised rate. Revenue was derived largely from the sale of copra and coconuts. Next in importance was the revenue from miscellaneous items of which limes (£143), cocoa (£125), compost (£125), mangoes (£108) and cassava (£80) may be noted. Revenue from cloves, at £454, was well below average. Approximately half of this amount was in respect of the portion of the 1958/59 crop sold in 1959 and the remainder was the proceeds of the very small "mwaka" crop of the 1959/60 season.

The plantations of Selem and Jendele, and to a less extent Kidichi, depend on cloves for a large part of their revenue. With continuing expenditure on development, these plantations usually suffer an overall loss when there is a poor clove crop, as they have again done this year. Chukwani plantation, an area of low-yielding coconuts on poor coral soil, again failed to cover costs, but it may be noted that the value of the grazing which is utilised by neighbouring cattle owners does not accrue to the plantation. At Kidichi and Selem plantations expenditure was inflated to an unusual degree by development work with cocoa, rising by £838 from £587 in 1958 to £1,425 in 1959.

Certain details of the clove harvest are given in the following table. The figures for the 1959/60 season include the "vuli" crop, picking of which did not cease until the end of February, 1960.

Season		Green cloves lb.	Dry cloves lb.	Dry stems lb.		Average clove prices per cental Shs.
1959-60		86,350	25,926	6,388	..	71.48
1958-59		20,176	6,224	1,595	..	112.36
1957-58		319,118	99,248	23,046	..	198.02
1956-57		212,165	71,455	19,994	..	198.30

The "*mwaka*" clove crop was picked largely by the regular daily paid labour. For the larger "*vuli*" crop casual labour was employed, at cents twenty five per pishi for most of the period and cents thirty during the final two weeks. In accordance with the Government policy of limitation of clove picking one quarter to one third of the crop was left on the trees and, of course, this resulted in a reduction of revenue.

The coconut crop was slightly less than average, totalling 2,251,876 nuts, compared with 2,290,257 nuts in 1958 and an average of 2,490,877 during the preceding three years. Coconuts were disposed of during the year as follows:—

Made into copra	2,019,604
Sold in the husk	201,121
Exported to United Kingdom ..	7,200
Used for seed	1,000
Found rotten	23,606

Of the nuts which were sold in the husk 101,700 were purchased by the Copra Board for planting. The following table gives details of the production of copra in 1959 and previous years.

Year			Nuts made into copra	Copra made tons	Nuts per ton of copra	Average price of copra per cental Shs.
1959	..	..	2,019,604	265	7,612	60.70
1958	..	..	2,175,262	302	7,194	51.13
1957	..	..	2,232,031	304	7,344	44.35
1956	..	..	2,327,369	325	7,153	44.89

It will be noticed that the number of nuts per ton of copra rose considerably during 1959. This fall in out-turn is even more marked when it is remembered that some ten years ago the average production was a ton of copra from 6,700 nuts. This reduction in out-turn, amounting to some thirteen per cent., must almost certainly be attributed to declining vigour of the trees. The export of husked nuts, which are selected from the bulk, inevitably reduces the copra out-turn of the remainder, but the quantity exported in 1959 was insufficient to affect out-turn to the extent shown.

The rates paid to coconut workers throughout the year were as follows:—

Climbers	Shs. 12/- per 100 trees
Collectors	Shs. 2/42 per day
Gatherers	Shs. 12/- per 1,000 nuts
Huskers	Shs. 5/- per 1,000 nuts
Breakers	Shs. 6/- per 1,000 nuts

The cocoa fermentary at Selem plantation was again used for the preparation of cocoa from the Government Plantations and also of cocoa harvested by the Department from private plots. The 1,117 lb. of Government Plantations cocoa realised Shs. 2,513.

The lime harvest was disappointing, showing a reduction on the 1958 figures which were also very low. The eight acres of lime trees at Dole yielded no more than 7.1 tons, as compared with $9\frac{3}{4}$ tons in 1958 and $23\frac{1}{2}$ tons in 1957. The fruits were sold to the Clove Growers Association at twenty cents per lb. for good limes and six cents per lb. for damaged limes and realised Shs. 2,874/36. Taking into account the costs of cultivation, harvesting,

transport and a watchman there was a nett loss of Shs. 1,291/54 or Shs. 161/38 per acre (Shs.-/81 per tree) compared with a profit of Shs. 119/60 per acre (Shs. -/60 per tree) in 1958 and a profit of Shs. 529 per acre (Shs. 2/64 per tree) in 1957. This serious drop in yield has been due very largely to withertip disease.

Continuing the policy of gradual development of the plantations, further plantings of tree crops were made at Kidichi and Selem. Some 3,046 clove seedlings were planted in new areas and 4,164 in gaps in previous plantings. A count of clove trees gave a total of 26,321 of which 18,202 are bearing trees and 8,119 seedlings or saplings. Of the total, 17,854 were at Kidichi plantation and 8,267 at Selem. Only 500 coconut seedlings were planted in 1959 compared with 1,633 in 1958. Some 460 coconut trees were lost through intentional fellings or deaths. The five Government Plantations are estimated to carry 107,800 coconut palms of all ages.

Greatly increased attention was paid to cocoa during 1959. Some 2,675 forastero cocoa plants, of which 2,365 were seedlings and 310 were rooted cuttings, were planted in the Kidichi and Selem plantations. The majority of these were planted in a plot of 3.4 acres at Kinuni Moshi which was previously under coconuts. In addition, cassia shade was removed from the criollo cocoa plots at Selem and Langoni wherever there appeared to be a likelihood that the cocoa trees—which are 12 years old and severely repressed in growth—would benefit. After removal of the shade the cocoa trees were sprayed against *Helopeltis* attack and within a few months showed an appreciable improvement. There now appears to be every likelihood of them bearing reasonable crops within two years.

11. Chemical Laboratory

The programme of analysis of Pemba soils was continued, and nine profiles of *bopwe* soil involving 54 samples were examined. The *bopwe* soil constitutes the greater part of the hilly areas of Pemba and is the principal soil on which cloves are grown. It was observed that exchangeable cations are higher than in the *utasi* soils, which were examined in 1958. Ranging from four to ten milli-equivalents per cent. in topsoils, total exchangeable cations decreased with depth to two m.e. per cent. or less. Available phosphate was low to moderate in six of the profiles and almost absent in three. Total nitrogen values were also low. In these respects the *bopwe* soil is similar to the *utasi* and *mtifutifu* soils and can be grouped with them as regards the need for improvement of their nitrogen and phosphate levels.

Continuing a survey of the trace element status of the soils of the Protectorate, seven examples of *kinyefu* soil from Pemba and two examples of shallow *kinongo* soil from Zanzibar were investigated using the Webb technique in pot tests. The elements investigated were manganese, copper, zinc, boron and molybdenum. No deficiencies were detected. The soils that remain to be tested are the *utasi*, *bopwe* and *makaani*.

An investigation of the potassium status of Zanzibar soils was begun, with a view to predicting potassium requirements from chemical analysis. Various extracting solutions were tested, so far without success.

Previous work had shown that coir dust ash had a high content of soluble K_2O but a microplot experiment in 1958 had failed to establish its value as a potash fertilizer. Six microplot experiments in 1959 with maize and cowpeas on the *kinongo* soils of Mkwauni and Makunduchi, in which the ash was compared with muriate of potash, were also inconclusive. A positive response to the ash was indeed obtained in two of the trials but both of these suffered from stem borer attack. In one of the other four trials there was a positive response to muriate of potash.

Examination of soils in which cocoa is growing well (Matangatwani) and poorly (Langoni), and of four plots in which cocoa is to be planted for demonstration purposes showed a lack of nitrogen, phosphorus and organic matter, with total exchangeable cations and pH (ranging from 4.7 to 5.5) comparable to those of the poorer type of West African cocoa soil. At Matangatwani available phosphorus was 14 parts per million only while in other plots it was nil. At Kinaoni, however, where the soil is deep *kinongo*, phosphorus amounted to 38 p.p.m. Artificial fertilizers or farmyard manure are likely to be indispensable for high production on these soils. It may also be desirable to correct the reaction of the soils, which except for the *kinongo* types are relatively acid.

Manganese has attracted attention and has been studied by leaf analysis. It has been found to be present in various species of crop plants growing on *mchanga* soil at levels which might be considered toxic elsewhere, though no clear case of toxicity has been established here. Thus in Zanzibar young cocoa leaves contain twice as much and old leaves six or seven times as much manganese as is considered to be unduly high for cocoa in Costa Rica. Liming has been shown to reduce manganese uptake in clove trees, applications of three tons per acre giving a leaf content of 430 to 610 parts per million as compared with a content of 630 to 1215 parts per million in untreated trees. Application of six tons of lime per acre reduced the manganese content still further. Leaves of Eucalyptus trees growing on the coral-formed *uwanda* soil contained twenty times as much manganese as leaves from trees grown on poor sands. Differences in manganese content of various soils did not appear to affect the vitamin C content of citrus fruits grown upon them. In all cases tested these were normal.

A severe chlorotic mottling of grapefruit at Hanyegwa Mchana was studied. Leaf analysis did not point to a nutrient deficiency, except that potassium uptake appeared to be restricted by the calcareous nature of the soil. Manganese, iron and boron levels appeared to be normal, but some difficulty was experienced with analysis for other trace elements. Sprays of iron, manganese, boron, zinc, copper, cobalt, and molybdenum were applied but no effects were observed.

Leaf analysis of cocoa and coffee which had been provided with a liberal mulch of coir fibre dust some twelve months before confirmed visual impressions that the trees were suffering from nitrogen deficiency. The mulch did not, however, upset the potassium/magnesium balance in the leaves, although it provides large amounts of potash.

Through the courtesy of the Tanganyika Government a survey of radioactive sands was undertaken by a geologist of the Tanganyika Department of Geological Survey assisted by the Government Chemist. Preliminary observations do not suggest that workable quantities are present in Zanzibar.

Other investigations undertaken by the Government Chemist included the determination of rotenone content in a derris trial and the assessment of mercury residues on limes sprayed against withertip disease.

Routine analyses of ylang ylang oil produced at the Clove Growers Association's distillery under the supervision of the chemical section were undertaken as usual, and the customary examinations of coconut oil and clove oil intended for export were made. Of the 995 samples of coconut oil, 13 per cent. failed to pass export standards, as compared with ten per cent. in 1958 and seven per cent. in 1957. This is a reflection of the increasing difficulty millers have experienced in competing for good quality copra.

Examination of water samples for the Public Works Department showed that certain new bore-hole supplies in Pemba had a high content of free carbon dioxide, which was causing rapid and serious corrosion of pipes and pumps and that some contained iron in solution. Some 176 samples of milk, blood and other substances were examined for the Health Department while 140 exhibits were reported on for the Police. Examinations were also undertaken and reports prepared for private concerns. During the year a total of 1,883 samples were received and reported upon.

12. Produce Inspection

The produce inspection services continued unchanged during 1959. Cloves, clove stems and copra were examined under the Adulteration of Produce Decree when offered for sale on the local market or to the Clove Growers Association and were passed or rejected in accordance with legal standards of moisture content and adulteration. Under the Agricultural Produce Export Decree all shipments of cloves, copra, coconut oil and chillies were examined to ensure that they conformed with minimum standards for the various grades of produce established under the Decree.

Towards the end of the year legislation was enacted providing for the introduction of a new series of grades for cloves for export, to become operative on 1st January, 1960. The new system has three grades in place of the previous four. The new grades are designated Special Quality, Standard Quality and Distillation Quality. As heretofore, the grades are differentiated on the basis of appearance, mustiness, extraneous matter, and the amount of weather-damaged (khoker) cloves. The standard set for the Special Quality has been raised by a reduction in the percentage of extraneous matter permitted. The Standard Quality amalgamates two previous grades with a slight improvement in quality. The Distillation Quality remains the same as the previous lowest grade except in respect of moisture. In all grades the maximum permitted moisture content is raised from sixteen per cent. to fourteen per cent.

Cloves of the 1958/59 crop continued to come forward for inspection up to the end of July by which time almost all the old season cloves had been brought forward. The new crop (1959/60 season) from Pemba was of good quality, failures due to excessive extraneous matter were few, and the khoker content was almost negligible. Good drying weather prevailed but there was nevertheless a high proportion of failures due to excess moisture. By contrast, Zanzibar cloves were less bright than in the previous season and shippers experienced some difficulty in obtaining their normal requirements of Bombay and grocery quality cloves, which are usually supplied by Zanzibar island. Apart from colour, quality was good and they were consistently drier than Pemba cloves. An accumulation of some 30,000 bags remained in the Zanzibar port area unsold at 31st December, owing to congestion in the Pemba market (in Zanzibar) and the Customs sheds.

The quantities of produce examined under the Adulteration of Produce Decree, in Pemba at the three ports and the Clove Growers Association's godowns and in Zanzibar at the produce market, during the calendar year were as shown in the following table.

Produce and Origin	Deliveries bags	Passed bags	Failed bags		Percentage of failures
			Excessive moisture	Extraneous matter	
<i>At Pemba:</i>					
Cloves	315,921	279,820	31,895	4,206	11.4
Clove stems	50,982	50,529	70	383	0.9
Copra	50,155	47,716	378	2,061	4.5
Total produce ..	417,058	378,065	32,343	6,650	9.3
<i>At Zanzibar:</i>					
Zanzibar cloves ..	36,847	34,905	1,584	358	5.3
Pemba cloves ..	262,136	231,648	27,167	3,321	11.6
Zanzibar clove ..					
stems	7,997	7,995	2	—	0.0
Zanzibar copra ..	150,790	141,020	8,445	1,325	6.4
Pemba copra ..	41,784	40,667	344	773	2.7
Total produce ..	499,554	456,235	37,542	5,777	8.7
<i>Protectorate total produce</i>					
	916,612	834,300	69,885	12,427	9.0

The total number of bags examined compares with 863,677 during 1958. The total percentage of failures was nearly double that for 1958, which was 4.8 per cent. only. These differences are due to a change in the relative proportion of cloves on the one hand and stems and copra on the other. In 1958 a large quantity of stems from the 1957 crop were brought for examination; on the other hand in 1959 there was a large clove crop but many of the stems from this crop would not appear until 1960.

Produce examined in Zanzibar prior to export included 149,870 bales or bags of cloves (9,360 tons), 7,912 tons of copra, 7,643 drums and 325 tins of coconut oil (1,441 tons) and 957 bags of chillies (33 tons). In addition, 91.3 tons of coconut oil were exported direct from Pemba after examination there. At the request of exporters, whole coconuts for export were examined for the presence of pests or diseases and phytosanitary certificates were provided for 2,199,850 nuts during the year.

The phytosanitary inspection of produce passing through Zanzibar port, and its disinfection where necessary, was also under the general control of the Inspector of Produce. This work is described in the following section.

13. Stored Products

The inspection and fumigation of imports liable to carry *Trogoderma* either in themselves or in their packing material continued throughout the year. Ninety seven vessels were inspected, as compared with 198 in 1958, and twenty six were found to be carrying *Trogoderma* as compared with eighteen only during the previous year. The 65,789 packages of infested goods or goods in close contact with them were fumigated in lighters by the London Fumigation Co. (Africa) Ltd., in twenty one fumigation jobs. Fumigation consisted of exposure to methyl bromide at a concentration of three lb. per 1000 cu.ft. for a minimum period of twenty four hours.

Shipments of Burma rice were invariably found to be infested with *Trogoderma*, whether they came direct or were loaded at Singapore after being fumigated there. One vessel which had loaded at Singapore contained clean rice from Thailand and infested rice from Burma. In July, a shipment of Pakistan rice was found infested for the first time; many subsequent shipments were also infested.

Most of the consignments of spices, especially of coriander, cumin and turmeric from India were found to contain *Trogoderma*. One consignment of 1,205 bundles of wet dates from Muscat and Barrah were found infested through the use of old rice gunnies as covers. This was the first time that *Trogoderma* had been found in cargo from the Persian Gulf. A consignment of coriander which was similarly infested, suffered deterioration in the fumigation lighter. Previous consignments had been fumigated without damage as was also a consignment of jaggery. All shipments from Portuguese East Africa, South Africa and Australia were found free from *Trogoderma* as were shipments from Thailand which were loaded at Bangkok.

Used gunny bags for export, whether empty or in use as containers, were fumigated prior to export. This involved fourteen fumigation jobs which were carried out in the inspection sheds under sheeting, and dealt with 6,336 bundles of empty gunnies.

Godowns and mills in Zanzibar town were also inspected for *Trogoderma* infestation. Altogether 116 inspections were made and *Trogoderma* was found in two godowns, in both cases in a small consignment of pulses. The contents of both godowns were fumigated. A few godowns were heavily infested with *Oryzaephilus surinamensis* and other pests and 54 of them were sprayed with malathion with good results. Twenty lighters were also sprayed.

Some shipments of rice imported into the Protectorate were found free from *Trogoderma* but carried large populations of other insects, particularly *Calandra* spp., *Oryzaephilus* spp. and *Tribolium* spp. Consignees treated some 1,575 tons of such rice by dusting the outside of the bags with Lindane 0.5 per cent BHC while taking delivery from the Customs import shed and a further 1,000 tons were so treated in godowns. Bundles of dates in hessian covers were also treated in a similar manner. This insecticide as well as 0.04 per cent BHC for mixing with infested grain, was purchased by merchants from the Department at cost price. Altogether some 1,700 lb. were bought.

The Tamarind Seed Borer, *Sitophilus linearis* was identified in tamarind received from Mombasa. A predator, *Thaneroclerus buqueti* Lefevre was found in coriander seed from India. It was observed that when confined in bottles containing coriander seed with various common storage pests it devoured adults and larvae of *Trogoderma granarium*, *Tribolium castaneum* and *Calandra* spp. and the adults of *Lasioderma serricorne*, *Sitophilus linearis* and *Oryzaephilus* spp.

In addition to the work in connection with *Trogoderma* and other storage pests, the station carried out inspections and issued phytosanitary certificates for export produce where this was required by exporters and maintained vigilance at the port to prevent the entry of prohibited plant material and fruits.

14. Principal Agricultural Legislation

The following is a list of the more important agricultural legislation promulgated during the year:—

Decree No. 8.	A Decree to Control the Setting of Fire to Land. Regulates the setting of fire to cultivated and uncultivated land, lime and charcoal kilns and coconut husks.	6.1.59
Legal Notice No. 34	The Dunga Forest Reserve (Constitution) Order, 1959. Constitutes Dunga uwanda plantation a forest reserve.	14.4.59
Legal Notice No. 64	The Agricultural Fires Decree, 1958 (Application) Order, 1959 Applies the provisions of Decree No. 8 to the Northern Mudiria of the Rural District of Zanzibar.	10.7.59
Legal Notice No. 66.	The Ngezi Forest Reserve (Constitution) Order, 1959. Constitutes Ngezi Forest in Pemba a forest reserve.	15.7.59
Legal Notice No. 102.	The Unguja Ukuu Forest Reserve (Constitution) Order, 1959. Constitutes the mangrove forest at Unguja Ukuu a forest reserve.	18.9.59

A. K. BRIANT,
Director of Agriculture

Zanzibar,
July, 1960.

Appendix I

Statement of Revenue and Expenditure of the Government Plantations

REVENUE TO THE NEAREST £

	<i>Kidichi</i>	<i>Selem</i>	<i>Mtoni</i>	<i>Chukwani</i>	<i>Jendele</i>	<i>Total</i>
	£	£	£	£	£	£
Cloves and stems	167	226	8	—	53	454
Copra	9,155	2,147	4,006	1,770	—	17,078
Coconuts	1,269	324	182	67	—	1,842
Coconut crops	9	8	298	143	78	536
Miscellaneous	383	336	208	20	4	951
Leased plantations	—	57	—	—	—	57
Rent of quarters	18	6	6	6	—	36
TOTAL	11,001	3,104	4,708	2,006	135	20,954
<i>Deduct</i> value of produce brought forward from 1958	447	—	609	33	—	1,089
BALANCE	10,554	3,104	4,099	1,973	135	19,865
<i>Add</i> value of produce carried forward to 1960	873	141	343	315	—	1,672
TOTAL 1959 REVENUE	11,427	3,245	4,442	2,288	135	21,537

EXPENDITURE TO THE NEAREST £

	<i>Kidichi</i>	<i>Selem</i>	<i>Mtoni</i>	<i>Chukwani</i>	<i>Jendele</i>	<i>Total</i>
	£	£	£	£	£	£
<i>Personal Emoluments:</i>						
Headquarters staff	1,019	289	404	212	—	1,924
Field staff	1,611	491	327	360	—	2,789
TOTAL PERSONAL EMOLUMENTS	2,630	780	731	572	—	4,713
<i>Other Charges:</i>						
Transport and travelling ..	117	54	23	23	27	244
Materials and tools	55	32	46	8	5	146
Labour	8,697	2,398	2,370	2,138	767	16,370
Repairs to buildings	475	86	141	52	—	754
Fuel and maintenance of vehicles	298	148	74	75	—	595
Hire of tractors	—	50	—	—	—	50
Cocoa development	274	65	—	—	—	339
GROSS TOTAL OTHER CHARGES	9,916	2,833	2,654	2,296	799	18,498
<i>Deduct</i> capital expenditure by Forest Officer	—	—	—	—	477	477
BALANCE	9,916	2,833	2,654	2,296	322	18,021
<i>Add</i> outstanding value at P.W.D.	45	22	12	11	—	90
TOTAL OTHER CHARGES	9,961	2,855	2,666	2,307	322	18,111
PERSONAL EMOLUMENTS	2,630	780	731	572	—	4,713
TOTAL EXPENDITURE	12,591	3,635	3,397	2,879	322	22,824
Profit	—	—	1,045	—	—	1,045
Loss	1,164	390	—	591	187	2,332

Nett loss .. £1,287

Distribution of Planting Material

Areca nut, seedlings	nos.	56
Avocado pear, grafted	"	57
Carambola, seedlings	"	10
Cassava, cuttings	"	190,000
Chillie, seedlings	"	467,000
Cinnamon, seedlings	"	10
Clove, seedlings	"	411,544
Cocoa, seedlings	"	202
Coconut, seedlings	"	110,212
Coffee, seedlings	"	15,524
Cowpeas, seed	lb.	78
Derris, rooted cuttings	nos.	29,600
Durian, seedlings	"	83
<i>Eugenia jambolana</i> seedlings	"	34
<i>Eugenia javanica</i> , marcotts	"	67
<i>Eugenia malaccensis</i> , marcotts	"	49
<i>Eugenia malaccensis</i> , seedlings	"	33
Grape fruit, budded	"	387
Groundnut, unshelled nuts	lb.	220
Guava, seedlings	nos.	20
Kapok, seedlings	"	344
Kudzu, seed	lb.	870
Lemon, smooth, budded	nos.	52
Lime, budded	"	9,648
" seedlings	"	843
Lime, sweet, budded	"	141
Litchi, marcotts	"	27
Maize, seed	lb.	1,529
Mandarin, budded	nos.	335
Mango, grafted	"	218
Nutmeg, seedlings	"	61
Orange, budded	"	2,990
Pepper, rooted cuttings	"	162
Pineapple, suckers	"	15,362
Pomelo, budded	"	58
Rambutan, seedlings	"	475
Rice, seed	lb.	4,627
Sapodilla, marcotts	nos.	19
" seedlings	"	184
Soursop, seedlings	"	27
Star apple, seedlings	"	50
Sweet potato, vines	"	8,250
Yam, tubers	lb.	8,312

NOTE: The sweet potato vines recorded above were issued from farms in Pemba and Zanzibar other than Kizimbani. There were larger, unrecorded, issues from Kizimbani. All the kudzu seed was exported.

Appendix III

Domestic Exports, 1959

<i>Items</i>	<i>Unit of quantity</i>	<i>Quantity</i>	<i>Value</i>	<i>Percentage of total value</i>
Cloves	cental of 100 lb.	206,767	2,657,767	69.53
Clove bud and stem oil	lb. ..	304,247	107,225	2.81
Copra	ton ..	8,031	556,931	14.57
Coconuts	cwt. ..	88,363	122,388	3.20
Coconut oil	" ..	28,835	170,800	4.47
Oil cake	" ..	31,596	37,001	0.97
Soap	" ..	18	35	—
Coir fibre, unmanufactured	ton ..	3,087	84,028	2.20
Coir fibre, manufactured	" ..	48	2,696	0.07
Chillies	cwt. ..	671	7,006	0.18
Kapok	" ..	—	—	—
Tobacco, unmanufactured	lb. ..	15,630	410	0.01
Fruit, fresh	cwt. ..	1,810	2,071	0.05
Lime juice	Imp. gallon ..	89	38	—
Lime oil	cwt. ..	2	449	0.01
Ox hides	" ..	853	6,640	0.17
Skins, sheep and goats	" ..	293	2,237	0.06
Livestock	no. ..	2	16	—
Forest products	value ..	—	15,292	0.40
Shells, marine	cwt. ..	4,456	19,252	0.50
Fish, dried or salted	" ..	34	732	0.02
Fish, fresh	" ..	100	2,770	0.07
Beche-de-mer	" ..	355	4,695	0.12
Seaweed	ton ..	30	1,485	0.04
Lime	cwt. ..	25,082	9,549	0.25
Other unclassified natural products	— ..	—	11,038	0.29
		TOTAL	3,822,551	100.00

Approximate Production of Cloves in Frasila of 35 lb. for Thirty-five Crop Years

(1st July to 30th June)

(Based on receipts of cloves at the Central Market and C.G.A.)

Season	Zanzibar Frasila	Pemba Frasila	Total Frasila	Mean crop per season in 5-year periods Frasila
1924/25	240,952	520,490	761,442	—
1925/26	219,192	392,622	611,814	—
1926/27	203,843	529,186	733,029	—
1927/28	190,370	500,382	690,752	—
1928/29	74,828	125,740	200,568	599,521
1929/30	318,647	610,296	928,943	633,021
1930/31	51,796	201,320	253,116	561,281
1931/32	175,070	760,786	935,856	601,847
1932/33	242,772	244,594	487,366	561,170
1933/34	146,098	781,090	927,188	706,494
1934/35	360,037	503,415	863,452	693,395
1935/36	65,938	232,571	298,509	702,474
1936/37	45,096	351,568	396,664	592,636
1937/38	446,500	909,416	1,355,916	768,346
1938/39	39,879	115,211	155,090	613,926
1939/40	168,041	501,474	669,515	575,139
1940/41	146,323	575,277	721,600	659,757
1941/42	297,578	889,550	1,187,128	817,850
1942/43	40,049	223,691	263,740	599,414
1943/44	263,423	777,218	1,040,641	776,525
1944/45	200,417	459,396	659,813	774,584
1945/46	26,493	161,075	187,568	667,778
1946/47	170,280	924,329	1,094,609	649,074
1947/48	30,914	280,986	311,900	658,906
1948/49	81,700	310,971	392,671	549,312
1949/50	153,888	430,253	584,141	514,178
1950/51	158,588	1,081,786	1,240,374	724,739
1951/52	45,892	290,007	335,899	572,977
1952/53	91,417	82,328	173,745	545,366
1953/54	179,883	1,101,302	1,281,185	723,069
1954/55	97,944	448,927	546,871	715,615
1955/56	139,132	746,093	885,225	644,585
1956/57	117,068	330,437	447,541	666,913
1957/58	220,803	1,327,664	1,548,467	941,858
1958/59	75,288	375,659	450,947	775,810
Average for 35 Seasons	157,899	517,061	674,951	—

Monthly and Annual Rainfall Totals for the Year 1959, for Stations in Zanzibar and Pemba

Pemba		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total 1959	Total 1958
Kigomasha	..	2.96	2.97	0.46	17.01	7.49	6.60	4.03	2.07	1.05	2.78	7.56	2.65	57.63	52.18
	..	9	6	2	22	14	10	13	10	8	14	12	9	129	139
Matangatwani	..	1.99	4.09	1.90	17.77	6.78	7.52	2.90	1.29	0.05	0.25	10.15	2.76	57.45	52.27
	..	7	5	1	21	13	11	13	9	3	5	13	5	106	135
Wete	..	3.18	2.22	0.51	20.28	7.04	7.66	1.71	1.81	0.42	0.55	10.73	4.39	60.50	52.80
	..	12	8	3	23	14	13	12	8	3	7	15	8	126	107
Limbani	..	4.17	2.84	1.62	17.94	9.40	3.11	8.13	2.10	1.04	0.38	12.87	4.60	68.20	48.62
	..	11	3	3	16	12	6	10	1	2	5	17	12	98	117
Ole	..	1.06	0.90	2.35	18.31	10.62	9.96	3.39	1.17	0.45	1.30	3.65	1.57	55.23	47.16
	..	6	5	7	19	12	11	9	4	4	5	7	8	97	116
Chake Chake	..	4.05	1.14	2.00	19.58	10.12	9.91	2.11	1.47	0.68	0.99	5.25	6.04	63.34	44.64
	..	11	6	5	20	12	9	16	7	5	5	8	11	115	108
Wesha	..	2.45	3.74	1.73	21.48	11.41	7.06	2.56	1.94	0.73	0.90	8.51	3.64	66.15	56.34
	..	14	8	3	22	13	12	16	7	6	3	12	11	127	152
Chambani	..	5.40	1.22	4.21	14.82	12.23	2.93	7.02	2.22	0.75	0.19	4.13	1.78	56.90	45.90
	..	9	7	7	17	9	6	7	6	3	4	8	12	95	88
Mtambile	..	6.10	5.51	2.26	22.63	9.53	8.17	0.94	4.10	0.19	1.06	5.66	6.53	72.68	70.21
	..	17	7	5	22	9	8	7	7	3	5	11	15	116	132
Mkoani	..	2.93	1.12	2.66	24.11	8.15	5.97	1.82	4.71	0.54	0.17	8.36	2.39	62.93	58.64
	..	7	4	5	20	12	12	12	10	7	2	12	9	110	110

